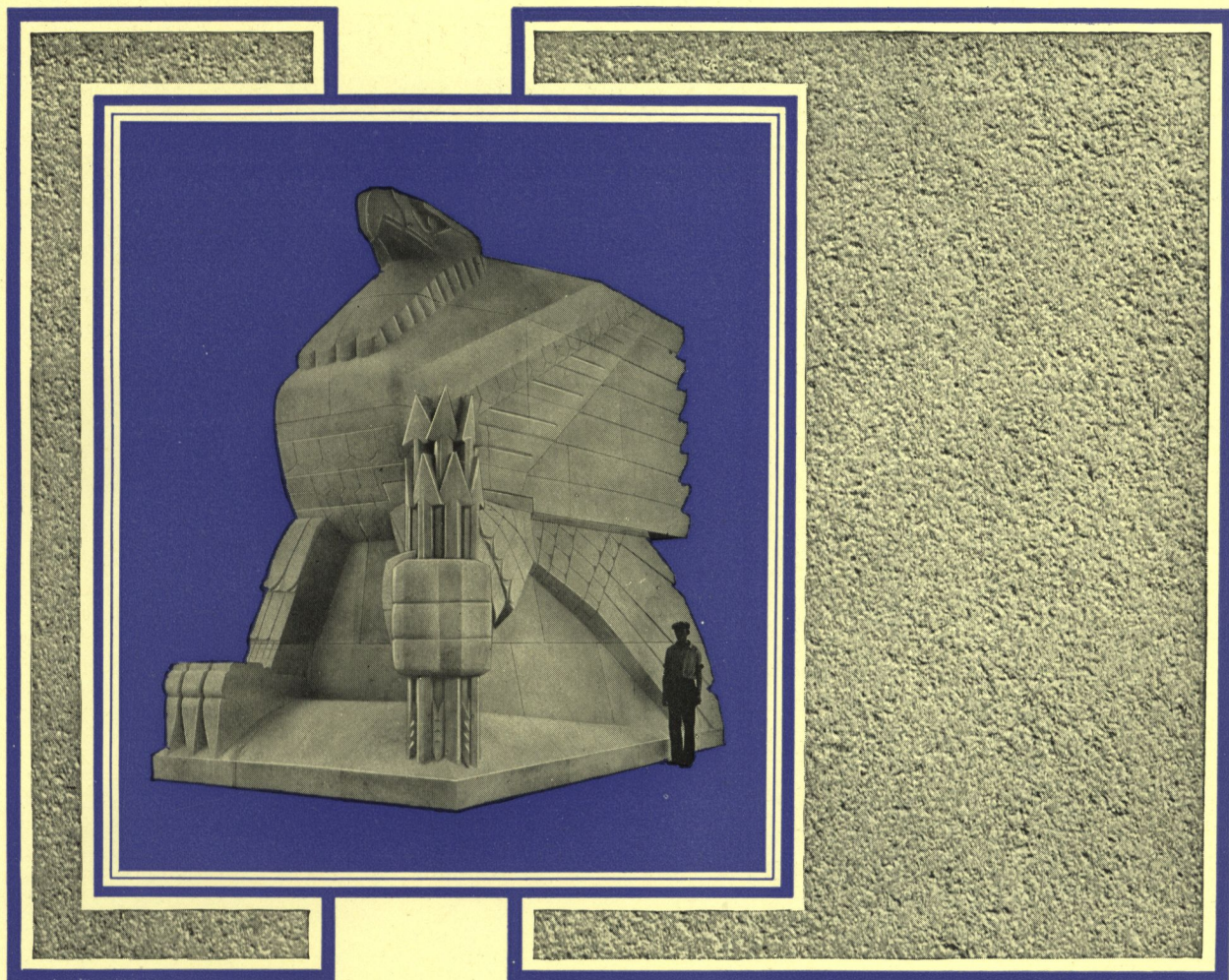
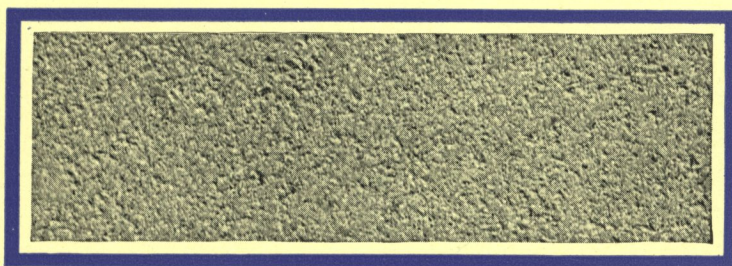


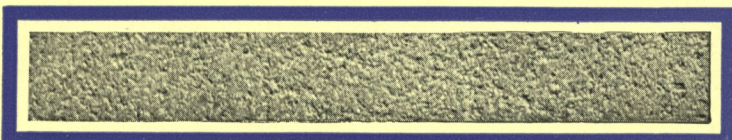


ILCO

SPECIFICATION MANUAL



INDIANA LIMESTONE Co.
BEDFORD, IND.



INDIANA LIMESTONE COMPANY

SALES AND SERVICE OFFICES

ATLANTA, GA.

BEDFORD, IND.

BOSTON, MASS.

CINCINNATI, OHIO

CLEVELAND, OHIO

DALLAS, TEX.

DETROIT, MICH.

KANSAS CITY, MO.

MINNEAPOLIS, MINN.

CHICAGO, ILL.

PHILADELPHIA, PA.

PITTSBURGH, PA.

ST. LOUIS, MO.

SYRACUSE, N. Y.

SAN FRANCISCO, CALIF.

WASHINGTON, D. C.

INDIANA LIMESTONE COMPANY OF NEW YORK, INC.,
NEW YORK, N. Y.

INDIANA LIMESTONE OF CANADA, LTD.,
TORONTO, CAN.

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INDIANA LIMESTONE COMPANY

Producers and Fabricators of Indiana Limestone
"The Nation's Building Stone"

GENERAL OFFICES AND ARCHITECTS' SERVICE BUREAU
BEDFORD, INDIANA

EXECUTIVE OFFICES: Tribune Tower, CHICAGO, ILL.

PRODUCT—GENERAL ADAPTABILITY

Indiana (Oolitic) Limestone

Indiana Oolitic Limestone (often called Bedford Stone) is found in commercial quantities only in *Lawrence, Monroe and adjacent Counties, Indiana.*

It is a non-crystalline limestone of fine even texture, characteristically a free-stone. The massive deposits forming the ledges in the hills of Southern Indiana constitute the most remarkable and probably the most useful building stone deposits in the world.

It is found in a variety of standard grades known as Gray, Buff, Variegated, Rustic and Old Gothic described in detail under a separate heading of "Grading." The Company's quarries also produce many special trade-named varieties of outstanding individual characteristics.

In color it varies in a wide range and mixture of color tones, from a light cream buff to a medium buff; from a light silver gray to a dark bluish gray and mixtures of both buff and gray.

Its permanence and durability have been firmly established by its use over a period of seventy-five (75) years and more in many of the country's most architecturally prominent buildings.

For complete data, see separate heading "Physical Characteristics."

Cost

Due to modern machine methods of quarrying and fabrication and quantity production, coupled with the wide range of grades readily obtainable, admirably suited to a great variety of appropriate machine finishes (see separate heading "Surface Finishes"), the cost is surprisingly moderate even when compared to less desirable and less permanent substitutes.

There is a grade and finish economically adapted to every class of work from the finest monumental structures and commercial building to the simplest store front, small commercial building, school, institution and industrial building.

ILCO-Riplstone, the sawed-four-side Indiana Limestone of short length stock, is well adapted to range work, random ashlar and other informal types of ashlar facing, for moderate cost buildings.

ILCO-Riplstone, the rough sawed strip stone, is particularly economical and suitable for use in decidedly moderate cost residences.

Selection of Most Suitable Material

Under the separate headings "Grading" and "Surface Finishes," are subheadings "Adaptability," applying



to each grade and to each finish. Both grade and finish should be selected conjointly since only certain surface or

texture finishes are appropriate for certain grades. Obviously, the rougher texture finishes are inappropriate and extravagant when applied to the finer, select grades of stone and vice versa.

Again, the selection of the kind and grade of stone for the particular building, depending on its type, class and architectural detail, is of paramount importance. In the exercise of good judgment in this respect lies great economy with no lessening of permanence, durability and usually increased artistic merit.

When the type or class of building would seem to demand only the best as good enough, there is a temptation to specify the fine-textured "Select," or what is really selected stone of the highest cost, for all parts of the work. This is rarely necessary or desirable.

All grades of Indiana Limestone are equal, in so far as soundness is concerned—see separate heading "Physical Characteristics" for confirmation. Furthermore, production processes in the cut stone mill are such as will automatically eliminate blocks or pieces that contain any possible planes of weakness, since in the average run of work, stresses set up in machining the stone and in handling it by travelers from one machine to another are greater far than would be permitted in building, and serve to effectively test all stone as it passes through the various milling operations to shape and prepare it for its position in the building.

For many types of structures, especially for sawed-finish wall facing or ashlar, the "Old Gothic" grade, which is decidedly low in cost, is the most appropriate. The moderate cost "Variegated" (mixed buff and gray) grade is most suitable for all purposes, both for ashlar and trim.

During the past few years many architects have shown a distinct preference and have increasingly specified the "Gray" stone on account of its fine, close, uniformly even color-tone, texture and density. It has fine weathering qualities together with dignity and pleasing color which progressively becomes lighter in shade with passing years.

Since the Company's quarries all lie within the boundaries of Lawrence and Monroe Counties of Indiana, the only locality where Indiana Oolitic Limestone is available in commercial quantities, the architect is warranted, both for his own and his client's protection, against substitutes in directly specifying the products of this company's quarries.

THE COMPANY—ITS FACILITIES



The Company

The Indiana Limestone Company, a Corporation of the State of Indiana, was formed April 19, 1926, and consisted of a merger of twenty-four (24) of the long established, favorably known, proven quarries of Indiana

Oolitic Limestone from which this dependable stone has been produced for generations. All of the quarries are located within Lawrence and Monroe Counties, Indiana.

The properties and plants acquired by the Indiana Limestone Company include nearly all of the larger Indiana Limestone producing companies located in the Bedford and Bloomington, Indiana, District as follows:

Bowman-King Stone Co.	Imperial Stone Co.
Brooks Cut Stone Co.	Indiana Quarries Co.
Clear Creek Quarries Co.	Inter-State Cut Stone Co.
The Consolidated Stone Co.	Mathers Stone Co.
Crescent Stone Company	W. McMillan & Son
C. D. Donato Cut Stone Co.	The Monroe County Oolitic Stone Co.
Doyle Stone Company	National Stone Co.
The Furst-Kerber Cut Stone Co.	John A. Rowe Cut Stone Co.
Hoadley Stone Co.	Shea & Donnelly Co.
J. Hoadley & Sons Co., Inc.	Star Stone Co.
Hoosier Cut Stone Co.	Struble Cut Stone Co.
Hunter Valley Stone Co.	United Indiana Stone Co.

The merging of these vast limestone interests into one well-financed, effectively managed organization is in line with the whole trend of modern, progressive business, the object of which is to secure all the benefits of organized quantity production together with the efficiency and economy inherent with it.

The principal viewpoint behind the consolidation, borne out by actual experience, is the more effective co-operation with the architectural and building professions, and the production of Indiana Limestone at a price that would make it even more attractive to the public, at the same time setting a higher standard of accuracy and a keener appreciation of the merits of stone in interpreting the spirit of modern art.

Responsibility

The Indiana Limestone Company is capitalized at over forty-six (46) million dollars. The company is rated in Dun's and Bradstreet's as First Grade of Credit—over \$1,000,000.00 (the highest rating given).

Quarry Capacity

The Company owns approximately 6,000 acres of land of which over 1,600 acres are proven stone land either now under or available for immediate quarry development.

Engineers estimate that at the present rate of production and shipment, there is sufficient stone in these proven areas for seventy (70) years' operation.

The Indiana Limestone Company has a quarrying capacity of 16,000,000 cubic feet per year, more than the present production of the entire district.

Mill Capacity

The cut stone mills of the Company have an aggregate floor area of 1,312,700 sq. ft. (equivalent to 30 acres) of space under roof for the cutting and fabrication of stone, exclusive of the area of miscellaneous and accessory buildings.

The mill capacity is 6,000,000 cubic feet of sawed stone and close to 4,000,000 cubic feet of cut stone per year.

Unsurpassed Production Facilities

With millions of dollars invested in modern machinery, equipment, buildings and a network of railway tracks, the Company's entire production is handled with precision and efficiency, more comparable with large-scale manufacturing than quarrying and fabrication as ordinarily accomplished.

This enables the Company to assure rapid delivery and unexcelled service, regardless of the quantity of material required, or the size or number of contract operations in work.

Transportation Facilities

Due to the central location of quarries and unsurpassed railroad facilities, the Indiana Limestone produced by the Indiana Limestone Company can be transported to all points in the United States and Canada with dependable promptness and at minimum cost.

Local Stock

The stock from this Company's quarries is carried in adequate quantities by cut stone contractors in nearly all the principal cities of the United States and Canada. It is a standard product available in quantity for prompt deliveries at all times—virtually everywhere.

Sales and Service Facilities

Sales and service offices in charge of experienced representatives are established in the principal centers. They are at all times accessible for effective co-operation. Samples of both the standard and special grades of the Company's product together with standard and special finishes will be promptly furnished on request.

Architects' Service Bureau

Architects and builders are cordially invited to make free use of the Architects' Service Bureau, maintained by the Company as a source of reliable unprejudiced information regarding its product, its most effective and economical use and for assistance in the solution of problems relating to the structural design and use of Indiana Limestone in building construction.

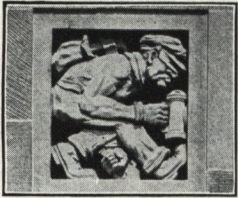
For examples of Structural Details for Indiana Limestone exemplifying and illustrating the best in recommended practice see "ILCO Details" published and distributed by the Architects' Service Bureau, Bedford, Indiana. These detail sheets are sent periodically to all Architects and Architectural Draftsmen who request them.

The bureau has accumulated much accurate information on construction in stone and related subjects not only through preparation of shop drawings but from research and field inspection carried over a period of some fourteen years.

Many technical bulletins covering this field as well as photographs of a large number of finished buildings of Indiana Limestone are available and freely used in answering inquiries.



PHYSICAL CHARACTERISTICS—INDIANA LIMESTONE

**(1) Composition and Structure**

Indiana Limestone is the type of rock termed by geologists as Oolitic Limestone, found almost wholly in Lawrence and Monroe Counties, Indiana. It is a calcite cemented calcareous sand rock formed of shells and shell fragments, practically non-crystalline in character. It is characteristically a *free-stone* without cleavage plane, possessing a remarkable uniformity of composition, texture and structure and equality of strength in all directions regardless of the plane of its natural bed.

It possesses a high internal elasticity, adapting itself without damage to extreme temperature changes and other prerequisites of permanence demanded in modern building structures.

The capillary attraction and absorption of the Standard grades is usually somewhat less than of the Select.

The average analysis as developed by carefully prepared composite samples is given below.

	<i>Buff</i>	<i>Gray</i>
Carbonate of Lime.....	97.39	97.07
Carbonate of Magnesia.....	1.20	1.20
Silica	.69	.80
Alumina	.44	.68
Iron Oxide.....	.18	.12
Water and Loss.....	.10	.13
	100.00	100.00

This composite analysis of these two varieties was made on samples from a number of the quarries, by the Chemical

Division of the Bureau of Standards at Washington, indicating that there is no important difference between the Buff and Gray varieties, both averaging over 97% carbonate of lime, the difference in color-tone being due solely to oxidation of the stone occurring above the natural ground water level in the quarry ledges.

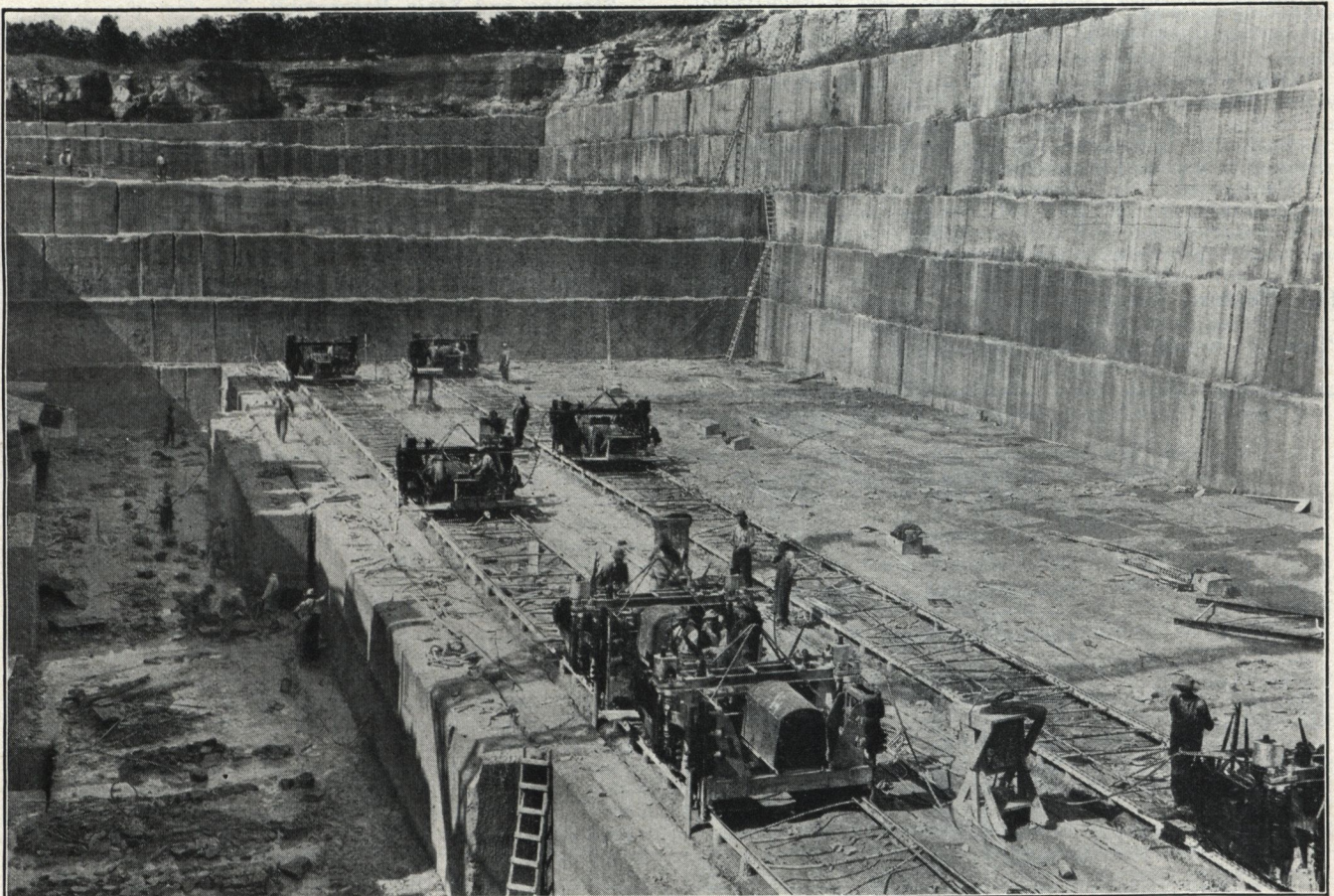
(2) Weight

The average weight of *dry* (seasoned) Indiana Limestone, as will be noted in the table on page 4, is 144 lbs. per cubic foot. The figures in this table applying to weight, specific gravity, etc. are all based upon authentic comprehensive tests and therefore supersede all previous, less comprehensive data establishing a greater weight, or values obtained from limestone in general, found in nearly all parts of the country and used principally as crushed stone for roads, concrete, etc.

(3) Strength—Recommended Values

The data in this paragraph is taken from the table on page 4 or from supplementary information developed by tests made at the Bureau of Standards at Washington.

Crushing Strength—From the table it will be noted that the crushing value for seasoned stone varies from about 5,000 to 13,000 lbs. per sq. in., averaging close to 7,000 lbs. per sq. in. Taking this value at 6,000 lbs. per sq. in. for any of the grades is conservative and sufficiently close for all practical purposes.



Ledge at the Indiana Limestone Company's Dark Hollow Quarry

The largest single ledge in operation in the Limestone district, measuring 1400 ft. long, 140 ft. wide, 60 ft. deep. This will cube 11,760,000 ft.; approximately 20,000 large car loads of Indiana Limestone



Tensile Strength — Tests were made with carefully cut briquettes on 35 specimens embracing 12 varieties of the product. The tensile strength for seasoned stone varies from 300 to 715 lbs. per sq. in., averaging 535 lbs. per sq. in. The test figures for the individual specimens in each set of 3 from the same variety of stone show good agreement. The range,

amounting to nearly 40% above and below the average, is accounted for by the marked difference in tensile strength between the more dense and the softer open grained variety of the product—a much greater variation than the corresponding difference in crushing value.

Although stone is seldom, if ever, used in tension, using a factor of safety of ten (10) with the above average results gives a conservative, working value of 50 lbs. per sq. in.

Transverse Strength—From the table it will be noted that the modulus of rupture varies from about 900 to 1600 lbs. per sq. in., averaging approximately 1250 lbs. On this assumption, with a factor of safety of ten (10) a working stress of 125 lbs. per sq. in. is applicable to the design of lintels and similar "stone beams."

Shear—It was considered unnecessary to conduct shear tests on all the grades and samples of stone which were included in the series of physical tests below tabulated. The shear tests were therefore confined to representative samples of grades, based upon the crushing and other tests, that were sufficient to show a full range of the product. These shear tests were made on the stone in 3 directions and the average taken for the figures below.

The shear value developed ran from 900 to 2300 lbs. per sq. in. for all grades tested, averaging 1600 lbs. per sq. in.

Elasticity—The coefficient of elasticity has been established as 4,400,000 lbs. per sq. in.

Expansion—The coefficient of expansion has been established as .0000027 in. per degree Fahrenheit.

(4) Color

Indiana Limestone is marketed in two color-tones, each of varying shades called "Buff" and "Gray" and in an irregular mixture of these two called "Variegated." See also rust brown staining developed by shot-sawing described under "Surface Finishes," paragraph 3, page 8.

Gray—The Gray is a beautiful silvery gray stone with a slightly bluish cast, and is often called "blue" by the trade. It is available in light and medium dark shades.

Buff—The Buff varies from a very light creamy buff or buff-gray to a distinct brownish-buff.

Variegated—The Variegated occurs in the quarries at the irregular juncture of the Buff and Gray stone and in the finished work consists of both buff and gray stone with some stone containing both color-tones in the same piece.

(5) Texture

For complete classification of the stone by texture, see "Grading—Indiana Limestone," pages 5, 6, 7.

(6) Fire Resistance

Indiana Limestone is to all intents and purposes fireproof. It calcines above 1500° F. and will not spall, crumble, split nor check when drenched with cold water.

(7) Specification Summary

Irrelevant Terms — From the data given under this heading it will be noted that many terms customarily included in the description of stone in no way apply to Indiana Limestone and are therefore purposely eliminated from the Master Specifications—see paragraph 4a1, page 12. Among these are freedom from "reeds," "seams," "spawl holes," "sand holes," etc., which apply more particularly to other materials.

The term "reed" applies to the plane of weakness that often occurs parallel to the rift or grain along the bedding planes of laminated stones, particularly in certain sandstones. Indiana Limestone has practically no grain and no weakness along the bedding plane. It is, in fact, about equally strong and may be cut or split with equal facility at any angle to the bed. For all practical purposes in building construction it is treated as a free-stone.

Little attention is paid in the working of this stone to its natural quarry bed. The great majority of ashlar is sawed with the grain parallel with the face of the wall. Monolithic columns are produced with the grain running vertically. Therefore, it is unnecessary to specify "that the stone be set on its natural quarry bed" as evidenced by the elimination of this clause in the specifications applying to Indiana Limestone in use by the architects of the United States Government—extensive users of this stone in important Government buildings for more than fifty (50) years.

The term "seam" applies to a structural defect, seldom occurring in Indiana Limestone and which would invariably be cut out in the production of the quarry block or slab before the stone reaches the cutting mill.

Small pits, which are left by cutting through a shell, are, in Indiana Limestone, unavoidable, except in the finest grain stone, and do not weaken or otherwise detract from its value.

Staining and Stain Prevention—The fact that frequent references to the prevention of staining occur throughout the specifications and the appendices should not be taken either to indicate staining to be a frequent occurrence, or that Indiana Limestone is particularly susceptible to staining.

Any light colored building stone, including the lighter colored granites, will show the effect of stain from *Portland Cement Mortar*, where improper construction details or methods that do not prevent this are employed.

Staining is not a fault of Indiana Limestone and is always preventable. Where staining has occurred, it has, upon investigation, been invariably found to be the direct result of lack of knowledge or proper care.

These references, therefore, constitute only a sincere endeavor based on definite experience and research to correct improper practices and make clear preventable sources of discoloration and stain.



PHYSICAL PROPERTIES OF INDIANA LIMESTONE

As developed by tests made at the Bureau of Standards, Washington, D. C., on 72 specimens of stone, including the more common grades produced by the Indiana Limestone Quarry District in Lawrence and Monroe Counties, Indiana

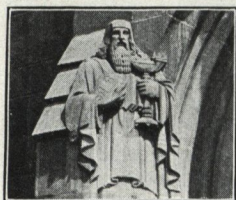
Grade	Compressive Strength				Transverse strength		Weight per cu. ft. dry	Absorption percentage		Apparent specific gravity
	Dry—lbs. per sq. in.		Wet—lbs. per sq. in.		Lbs. per sq. in.					
	On Bed	On Edge	On Bed	On Edge	⊥ to B	to B		By wt.	By vol.	
Statuary buff.....	6525	6320	6148	5931	1357	1021	140	5.52	12.32	2.24
Select buff.....	7426	6743	6837	6290	1292	1022	144	4.75	11.14	2.30
Standard buff.....	6251	5455	6260	5458	1044	946	142	4.97	11.27	2.28
Rustic buff.....	5954	5333	5607	5089	1090	934	142	5.36	12.13	2.27
Select gray.....	8519	7121	7655	6781	1387	1107	145	4.26	9.86	2.32
Standard gray.....	7093	6064	6889	5951	1344	1272	147	4.28	9.87	2.35
Variegated.....	7640	6515	7149	6208	1309	1206	145	4.34	10.05	2.32
Special hard grades.....	12769	13080	10417	10038	1614	1618	150	3.60	8.52	2.40
Average values.....	7757	7016	7123	6439	1395	1148	144	4.60	10.58	2.31

Note: The average values are the average of the various grade averages given above, not the average of all specimens tested; that is, they are not weighted averages.

⊥ to B—indicates that the load was applied perpendicular to the bedding.

|| to B—indicates that the load was applied parallel to the bedding.

GRADING—INDIANA LIMESTONE

**(1) Introduction**

The grades given under this heading define the range of variation in texture and the markings that are characteristic of and permissible under the system of grading adopted by the Indiana Limestone Institute.

It has been adopted as "Standard Practice," with the exceptions noted, to submit two (2) samples for grade approval, showing the maximum and minimum of fineness and coarseness of texture to establish the range of variation from uniformity, instead of one sample intended to indicate the average run of the particular grade.

In the case of "Statuary Buff," a single sample will suffice. In the case of "Variegated," three samples are submitted showing the range of color and texture. In the case of "Old Gothic" there is no fixed limit as to the number of samples which may be required to adequately fix the limit as to variation in texture, formation and markings characteristic of this grade.

The selection of grades of stone should be made conjointly with the selection of the Surface Finishes (see page 8) and the Colors (see "Physical Characteristics," par. (4), page 4) since the architectural effect of most of the various finishes is dependent upon the particular grade of stone to which they are appropriately applied.

That this selection may be accomplished with the greatest economy and intelligence, the facilities and experience of the Architects' Service Bureau of the Company are at all times accessible for co-operative counsel. Lists and photographs of existing buildings with complete data as to grades and finishes of stone used are obtainable on request.

(2) Classification

Select Gray	Variegated	Select Buff
Standard Gray	Old Gothic	Standard Buff
Rustic Gray		Rustic Buff
*Special Hard Gray		*Special Hard Buff
	Statuary Buff	

*These grades are select in texture.

(3) Statuary Buff

Description—This grade covers only the very fine uniform grained Buff stock. In the texture the grain shall not exceed one millimeter (about 1/25 in.) in cross-section, visibly uniform and well cemented in structure and entirely free from seams, streaks and pit-holes, and without calcite crystals larger than four millimeters (about 1/8 in.) in diameter.

Adaptability—Principally used for sculpture, carved doorways, tracery, sculptured panels, memorials, mantels and elaborate interior work.

(4) Select—Gray and Buff

Description—"Select" stock (both "Gray" and "Buff") is sound and durable and shall embrace the average finer grained stone, in texture ranging from the finest, most uniform grained stock to stone having an average grain, as shown by the samples and photo reproductions thereof designating the range of this grade.

It shall include stone in which any openness of grain does not show pore spaces exceeding about one mm. (1/25 in.) in diameter and in which tight fine opaque white or glass-like calcite streaks or veins not exceeding one mm. (about 1/25 in.) in width, may occur and will include stone having occasional solid fossils and grains, crystals or spots of calcite. Pit-holes not exceeding six mm. (about 1/4 in.) in diameter may occur, providing that there are not more than the equivalent of one of these to any ten square feet of area of slabs, nor more than 15% of the cube of blocks so affected, and in which any of these allowed minor variations in the formation and texture do not constitute a defect that impairs the strength and durability or appearance of the fabricated and finished stone-work produced therefrom, and when appreciably affecting the appearance are such that can be eliminated readily from appearing on the face of stonework in the finished building.

Adaptability—For Ashlar or Field, should be confined to the finest monumental types of buildings where cost is not a

prime factor and where "Smooth Machine," "Rubbed," or "Machine-tooled" finishes are appropriate. Particularly adapted in the better work for moulded and plain trim and carved and sculptured detail where the ashlar or field is of coarser, less expensive, stock. Advocated particularly for lower story work, entrances and similar details. The "Buff" may be substituted on the simpler work for the "Statuary" grade adaptations.

Choose "Select Gray" or "Select Buff" for characteristic color-tone desired. (See "Physical Characteristics," par. (4), page 4.)

(5) Standard—Gray and Buff

Description—"Standard" stock (both "Gray" and "Buff") is sound and durable and is the average of the moderately large grained product of the quarries that constitutes the bulk of the total output of stone and is therefore classed as "Standard." This grade has certain variations in density, color-tone and texture not allowed in "Select" and may contain streaks of calcite or moderately coarse grained or reedy formation and small pit-holes, providing such variations in texture and color-tone do not exceed the following limits, or impair the strength or durability of the stone. Texture or grain ranging from "Select" to a somewhat shelly appearing formation having an average grain, as shown by samples and photo reproductions thereof designating the range of this grade. White calcite or crystalline streaks, not over four mm. (about 1/8 in.) in width, nor more than one such marking in any 30 sq. ft. of stone so affected. Glass-like calcite streaks or veins not over two m.m. (about 1/12 in.) in width nor more than one such defect in any 30 sq. ft. of stone so affected; coarse or open texture bands averaging not over one inch in width, nor shall it aggregate over 6% of the measurement across grain; pit or shell holes aggregating not over one sq. in. in area to any 30 sq. ft. of stone; stock to be well cemented and with the exception of the pit-holes and coarse somewhat open-textured streaks allowed, shall not be visibly open or porous in general structure.

Adaptability—Adapted to the great average of work where a general uniformity of color and texture is desired and cost is a consideration. Particularly adapted to the ashlar or field in the better types of commercial and the less pretentious monumental buildings where "Select" stock is not appropriate or warranted and the slight variations in texture are an addition to rather than a detracting from the general character of the design. Entirely satisfactory in quality and appearance for the simpler trim, especially above the lower story. Adapted to the smoother finishes, such as "Sand-sawed," "Sand-sawed Slightly Rubbed," "Smooth Machine," "Rubbed" and "Machine-tooled."

Choose "Standard Gray" or "Standard Buff" for characteristic color-tone desired. (See "Physical Characteristics," par. (4), page 4.)

(6) Rustic—Gray and Buff

Applicable to Both Rustic Gray and Rustic Buff—"Rustic" stock is sound and durable and shall embrace the coarser, more or less open shelly grained stone, having a varying amount of crystalline calcite intermixed, including stone having a decidedly coarse with some honey-comb formation, as shown by the samples and photo reproductions thereof designating the range of this grade.

It may include some stone which is darker in color-tone, some stone with streaks of fine texture and some stone that is quite hard, due to the size and amount of crystalline calcite that it contains. This grade is therefore distinctly coarser and more varying in texture, showing a wider range of granular formation and more variation in color-tone than any other grade, except "Old Gothic."

Buff—Rustic Buff may contain an average amount of very open grain stone of more or less cellular formation like travertine and stone of appreciably darker color-tone.

Gray—Rustic Gray by the nature of the deposit will generally be somewhat denser in formation than Rustic Buff, and regardless of its coarse shelly texture, it will usually be practically free of any very open grain, travertine-like cellular formation characteristic of some Rustic Buff stock.





vision where variations of texture and color are desirable.

Choose "Rustic Gray" or "Rustic Buff" for characteristic color-tone desired. (See "Physical Characteristics," par. (4), page 4.)

(7) Special Hard—Gray and Buff

Description—"Special Hard" (both Gray and Buff) for the purpose of grading is classed as "Select." It is the fine grained, hard, dense stone similar to the regular "Select" grade in texture and may be included as such, but as a grade by itself, shall be specially selected for its hard, dense, usually somewhat crystalline texture.

Adaptability—This grade is particularly suitable for grade or base courses, steps, platforms, floor tiling, paving and other walkway surfaces. It is also well adapted to use for members with wide shallow washes and for coping and exposed capping stones where the utmost in close grained, hard, weather-resisting and water-shedding characteristics are desirable. Like the "Select" grades it is particularly adapted to the smoother finishes.

Choose "Special Hard Gray" or "Special Hard Buff" for characteristic color-tone desired. (See "Physical Characteristics," par. (4), page 4.)

(8) Variegated

Description—"Variegated" stock is sound and durable and embraces the irregular mixture of the Buff and Gray color-tones which occur in the blocks that are quarried where the Buff and Gray color-tones adjoin in the quarry ledges and includes stone showing variation in texture as well as the variation in color-tone, as shown by the samples and photo reproductions thereof designating the range of this grade. "Variegated" stock includes stone that may vary in texture from the lower range of "Standard" up through "Select" as herein graded by texture and consequently from moderately large to quite fine grained stone and will include some stone containing streaks or veins or crystalline calcite and bands or areas of shelly formation that do not affect the structural soundness of the stone, or make the stone stock too coarse or variable to be used for the average run of "cut stone" work, trim, etc. It is understood that while the quarry blocks shall contain stone of both color-tones, Variegated stock when cut up for building purposes, will, in the finished work, produce pieces of solid Buff and solid Gray and only a certain percentage of stone with the two color-tones in one piece. The coarser variegated stone is sometimes listed as Old Gothic.

Adaptability—Adapted to the great average of work where a distinct variation and mixture of color-tones (both Buff and Gray) and general uniformity of texture are appropriate. May be used for both ashlar and trim with the smoother finishes and for ashlar or field in the rougher finishes, such as "Sand-sawed" and "Shot-sawed." Variegated is sometimes considered inap-

propriate for columns or other trim units of large size where separate color tones might look out of place. (See "Physical Characteristics," par. (4) page 4.)

(9) Old Gothic

Description—This grade of stock is sound and durable and embraces Gray, Variegated and Buff. It includes stone of pronounced texture, unselected as to color, ranging from a fine to a distinctly coarse grain, and may contain shelly, honey-comb formations with both white and dark crystalline streaks or streaks of glass-like calcite and tight crowfeet, none of which, however, affect the structural soundness and weathering properties of the stone. For this grade of stone there are no fixed limits as to variation in texture, general formation and surface markings, and when the material is fabricated some pieces will be produced in solid Buff and in solid Gray.

Adaptability—Particularly adapted to the less formal types of architecture where an extremely wide range and mixture of both color-tones (both Gray and Buff) and texture are appropriate. May be used for simple, coarse trim combined with the same stone for ashlar or field. Especially adapted to the coarser finishes such as "Sand-sawed" and "Shot-sawed."

(10) Special Varieties of Stone Produced by Indiana Limestone Company Quarries

In addition to the regular grades of stone which this company produces under the grading established by the uniform classification of the Indiana Limestone Institute, this company also produces in unlimited quantities, the series of trade named varieties of its product as hereafter listed, the trade names of which are copyrighted as applying only to the product of the particular quarry or ledge designated thereby which possesses some distinctive characteristics.

It should be understood that these trade named varieties do not constitute another series of grades nor are they in most cases "off-grade" varieties but simply stone that possesses some distinctive characteristics, either in structure or formation in texture or in color-tone.

Where a specific kind of stone of known satisfactory quality and unique artistic merit is desired, the architect is justified in specifying these well and favorably known trade named varieties.

The relation of these trade named varieties to the regular grading under the uniform classification may briefly be explained by the following:

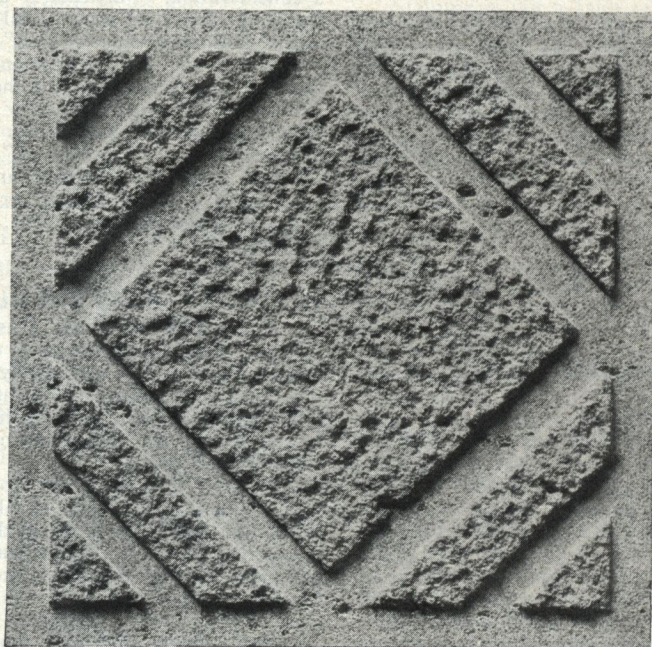
P. M. & B. Buff—The well known buff from this famous quarry is obtainable in both the "Select" and "Standard" grades and to an unlimited extent in "Rustic."

Dark Hollow Gray—The fine, dense uniform textured Gray stone from this celebrated quarry, obtainable chiefly in the "Select" grade though also in "Standard" and to a very limited extent in "Rustic."

Eureka Variegated—About the most distinctive Variegated stone produced by the Indiana Limestone district, having a more marked contrast between the Buff and Gray than most of the Variegated stone.

Hoosier Silver Gray—A fine textured very light Gray stone produced principally in the "Select" grade.

University Buff—A fine, even textured Buff stone of very light color-tone produced principally in the "Select" grade.

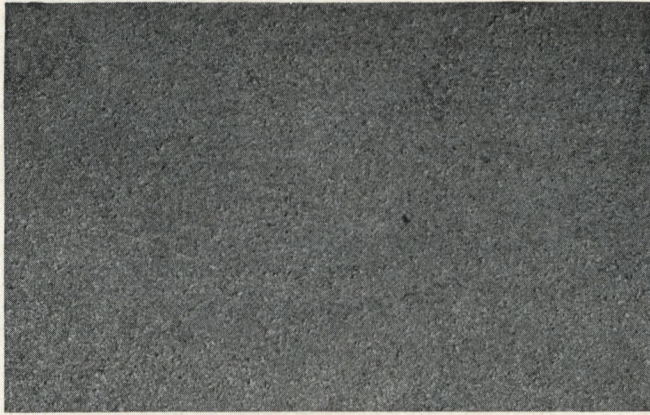


ILCO SPANDRELS

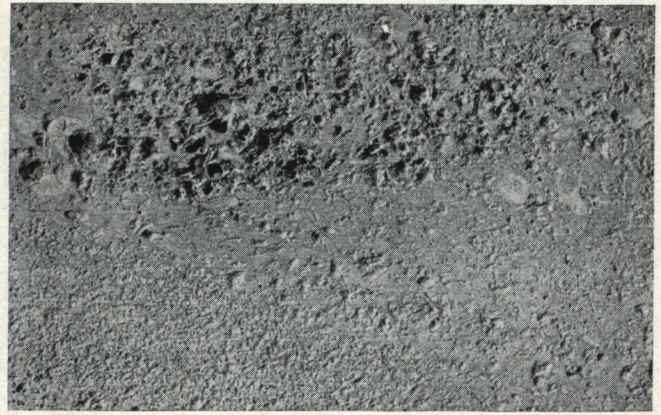
ILCO Spandrels have been especially designed to meet the requirements of the modern office building. They can be cut to harmonize with almost any design and when so desired the entire spandrel including window sills and lintels can be cut in one piece. The cost of setting is very low so that the cost in place is no greater than many inferior substitutes.

Detailed information will be furnished on request.

TYPICAL SAMPLES (FULL SIZE) ILLUSTRATING GRADING



(A) Statuary Stock and Maximum Degree of Fineness of Select Stock



(D) Minimum Degree of Fineness of Rustic



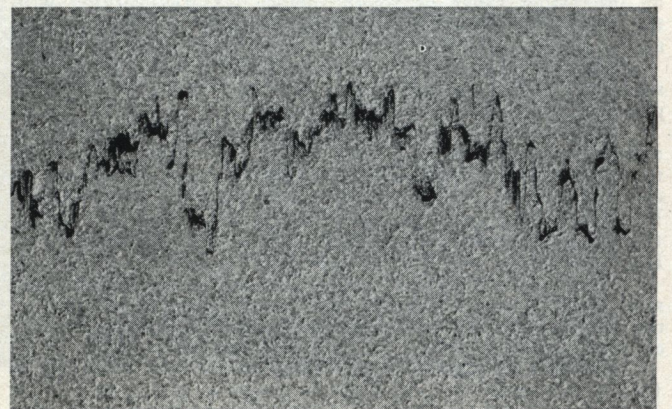
(B) Minimum Degree of Fineness of Select and Maximum Degree of Fineness of Standard



(E) Variegated



(C) Minimum Degree of Fineness of Standard and Maximum Degree of Fineness of Rustic



(F) Crowfoot

The conventional grades of Indiana Limestone, Select, Standard and Rustic are classified by their fineness of grain. This fineness does not change by jumps but gradually from the finest to the coarsest. Consequently two samples are furnished, one showing the maximum; the other, the minimum degree of fineness for the grade specified. The cuts on this page show the *limits* of fineness, separating Statuary, Select, Standard and Rustic.

Stone is graded for both fineness and color when quarried and each block is marked with grade, quarry ledge and individual number. With some few exceptions each quarry produces all the grades but in varying proportions.

Statuary includes only the finest grain stone (A); all stone between fineness A and B is graded as Select; between B and C as Standard and between C and D as Rustic.

Variegated (E) is a mixture of buff and gray unselected as to texture though the fine stone predominates.

Old Gothic is a mixture of Rustic and Variegated and also includes some few stones having "crowfeet" (F) as well as glass seams and other markings not affecting the strength of the stone. See paragraph 9, page 6, detailed specification. Variegated stone included under this classification is generally coarser in texture than that graded as Variegated.

SURFACE FINISHES—INDIANA LIMESTONE

**(1) Introduction**

Indiana Limestone in addition to the large range of grades of stone (see "Grading," page 5) and color-tones (see "Physical Characteristics," par. (4), page 4) is adapted to a wide variety of standard machine and hand-tooled finishes. Many new and special finishes are constantly being developed.

The selection of the surface finish should be made jointly with the selection of the Grade and Color of the stone, not only from the viewpoint of adaptability to the architectural design, but because of its particular adaptation to the grade of stone to which it is applied, its position in regard to close inspection, its function or purpose, and its relative cost.

That this selection may be accomplished with the greatest economy and intelligence, the facilities and experience of the Architects' Service Bureau of the Company are at all times accessible for co-operative counsel. Lists and photographs of existing buildings with complete data as to grades and finishes of stone used are obtainable on request.

Data under this heading is intended to establish for specification use those finishes most commonly used and their adaptability.

(2) Sand-sawed Finish

Description—The surface left as the stone comes from the gang-saw. A moderately smooth, granular surface varying in texture with the grade of stone. Sometimes contains shallow, parallel scores or saw marks.

Adaptability—The least expensive finish. Particularly adapted to the various types of ashlar of the coarser grades of stone.

Ideal and economical for commercial structures, especially above the first story. In the best work of this type partial rubbing may be added (see par. (5)). Use for plain ashlar only—not obtainable on moulded or cut work.

(3) Rough Short-sawed or Ripple-face Finish

Description—A rough gang-saw finish produced by the addition of chilled steel shot to the sawing sand. Produces an interesting range of rough surface textures varying with the composition of the stone and the amount and type of shot used.

Range runs from a medium rough, rather uniform, pebbled surface to a surface heavily ripped up with irregular, roughly parallel grooves.

Adaptability—Little, if any, more expensive than sand-sawed finish; except where the return heads must be finished to correspond with the textured face. This finish should be confined to the four coarser textured grades: Variegated, Rustic Buff, Rustic Gray, Old Gothic. Adapted to the various types of ashlar or field work. Used almost exclusively for ILCO-Riplstone.

May be combined with varying proportions of sand-sawed stock for field or ashlar, trimmed with either Variegated or the finer grades of Indiana Limestone customarily used for cut stone work.

Added Color-tone Range—The shot-sawed finish has a further advantage by widening the range of color-tone. This is accomplished by allowing some of the saw-slush to remain on the surface of the stone, permitting a varying amount of rust stain to develop on the surface, adding the brown tones thus obtained to the natural color variations of the stone itself. This is nature's coloring matter and absolutely permanent.

(4) Smooth Machine Finish

Description—The generally recognized Standard Machine Smooth finish. Produced by the planers, without hand work other than the removal of objectionable tool marks where they occur.

While referred to as smooth, it is a machine finish and the surface always has a certain amount of texture.

Adaptability—This finish is always furnished for all parts of the work, both plain and moulded surfaces, when other finish is not specifically designated.

An economical finish for all grades of stone, particularly those of fine texture where a smooth finish is desirable and appropriate. Obviously, it will remain cleaner than the less smooth textures.

(5) Wet Rubbed Finish

Description—Where a really smooth finish is desired, sand and water rubbed or Carborundum and water rubbed finish should be specified. (Grinding smooth with dry carborundum or gritstone is not recommended.)

Adaptability—Specify for all parts (plain and moulded surfaces) wherever a smooth dirt and grime resisting finish is desired. Adapted to all grades, but particularly to the finer textured stones.

An excellent procedure is to require that the lower story be sand and water rubbed and leave the balance of the work as it comes from the planers or saws.

(6) Honed Finish

Description—A superfine smooth finish.

Adaptability—Usually confined to fine interior work.

(7) Machine-tooled Finishes

Description—The customarily used machine-tooled finishes are four (4), six (6) and eight (8) bats (parallel, concave grooves) to the inch—*specified as 4, 6, and 8 cut work*. Two (2) bats to the inch tooling is occasionally used on large scale work and ten (10) bats to the inch where especially fine tooling is desired. Convex tooling, less usual, can be furnished where required.

Two-bat tooling, on account of the necessity of matching the flutes, is very expensive. Ten-bat tooling is so fine as to be invisible at a comparatively short distance from the building.

Adaptability—Not employed as much as formerly, but when used, principally on ashlar surfaces with mould work finished smooth. Tooled mouldings can be cut by machine only in the direction of the mould. When cut across the mould work must be done by hand and is expensive. Tooling on ashlar and large fillets is generally vertical.

(8) Carborundum Finish

Description—A very smooth finish produced by use of a carborundum machine instead of a planer.

Adaptability—Lower in cost than Honed Finish and smoother than Wet Rubbed. May be specified for flat surfaces of any area and for mouldings whenever there is sufficient length (about 500 ft.) of one profile.

(9) Plucked Finish

Description—This is another machine finish obtained by rough planing the surface of the stone, breaking or plucking out small particles. This gives an interesting rough texture to the stone.

Adaptability—It is often used as a finish on cut stone trim of buildings faced with ILCO-Riplstone.

(10) Other Machine Finishes

Description—Machine finishes have been developed closely resembling many of the hand finishes. Others are adapted to particular parts of buildings, such as spandrels, special rusticated ashlar, etc.

Adaptability—The imitation hand finishes can be applied to areas larger than economically possible with hand finishes and can be distinguished from them only by very careful inspection.

The special features make possible obtaining outstanding effects in buildings at low cost or the production of particular effects desired by the architect.

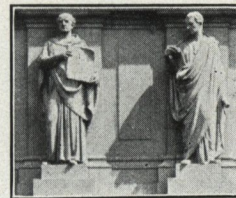
(11) Hand-tooled Finishes

Description—Due to their greater cost over the more generally used modern machine finishes, particularly when applied to large areas, hand-tooled finishes should be confined to accent points where the cost is warranted.

Various types of hand-tooling are particularly adapted to Indiana Limestone, such as crandalling, drove and tooth chiseling.

Where rough effect is desired, the "rough picked" or "hand pointed" finishes are often used.

Special finishes to meet special requirements will be prepared by the INDIANA LIMESTONE COMPANY and samples will be submitted to form the basis of specifications.





Adaptability—The judicious use of a small amount of hand-tooled finishing to accent certain architectural details of an otherwise smooth machine-finished building will often add much to the character and distinction of the design.

A small amount of hand-tooling in contrast to plain surfaces or machine-tooled work, will generally give a richer effect than where there is an over-abundance. Hand-tooling, like sculptured detail, needs a contrasting background to attain its full value and effect. Thus quoin or arch stones, certain quoining of rusticated work, lintels and similar details can often be hand-tooled to advantage to contrast with plain rustication or plain walls.

(12) Rusticated Work

The rustication of ashlar may in a general way be considered as a finish, since it is an important factor in giving texture to the surface of the building. The width and depth of the rustication and the shape of the groove or channel will contribute materially to the effect as well as the finish of the stone itself. Too great a depth to the rustication often adds materially to the cost without improving the effect.

The faces of rusticated work may be plain or tooled in various ways with a plain or tooled margin draft around each facet. The tooling on rusticated work is quite generally done by hand.



ILCO-RIPLSTONE

Below are two typical examples of ILCO-Riplstone, a Rough Shot-sawed or Ripple Face Finish (see Par. (3), page 8).

The grooving of the ripple finish may be made to run in the same direction on all strips, either vertical or horizontal, as preferred. Some of the pieces of stone will be more or less uniformly roughened like rough-textured tapestry brick; while the surface of other pieces will be irregularly corrugated or rippled to a degree that it is impossible to obtain in any other material.

The beauty of ILCO-Riplstone is enhanced by the fact that no two pieces of stone or the entire area of any single piece is the same either in texture or color-tone. A soft, mellow, shadowy effect is the result. It is not only admirably suited for range work and random ashlar masonry, but for coursed ashlar and plain areas of cut stone work as well.

The cost of ILCO-Riplstone is quite moderate and often enables natural stone to be used for plain wall surfaces in strict competition with less desirable materials.

While ILCO-Riplstone was originally developed more particularly for range work and random ashlar in ecclesiastical,

collegiate and residential construction, it has grown so tremendously in popularity with architects that it has already been used also for the finish of plain surfaces of cut stone work in commercial buildings of nearly every type—hotels, apartment buildings, banks, office buildings, store fronts, etc.

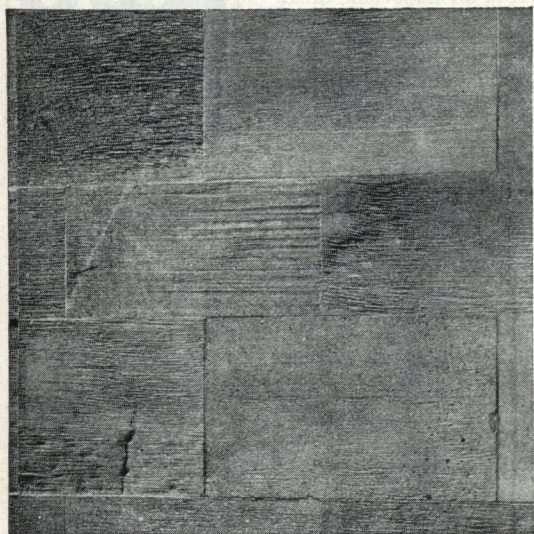
"333" North Michigan Avenue Building in Chicago, designed by Holabird & Root, Architects, is a recent example of ripple finish on cut stone work in tall commercial buildings. This building was awarded a gold medal as the most distinctive structure erected in Chicago during 1928.

The colors, along with the natural variation of the stone itself, range from almost a rust-color brown through warm tawny browns and grays of various shades to a mellow, creamy buff.

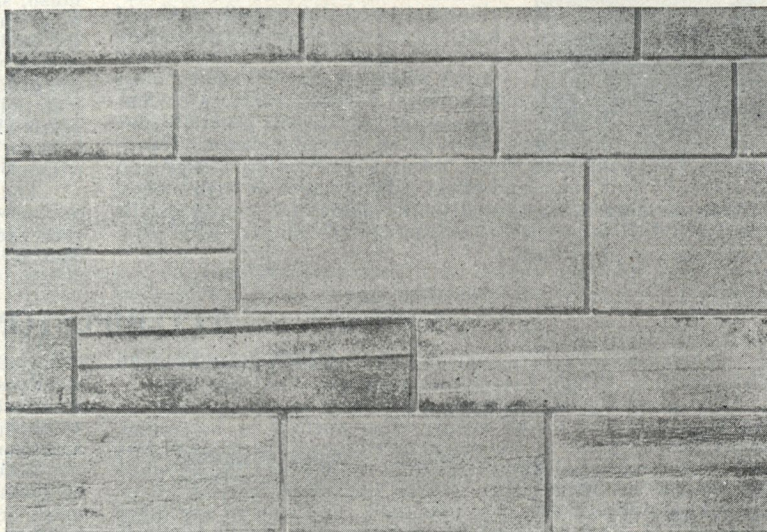
The ripple face stone is recommended for plain wall surfaces only. Moulded and ornamental work of all kinds, and all items of cut stone trim that occur in conjunction with it, will be either machine or hand finished as required, forming a pleasing, decided contrast with the ripple finish of plain wall areas.



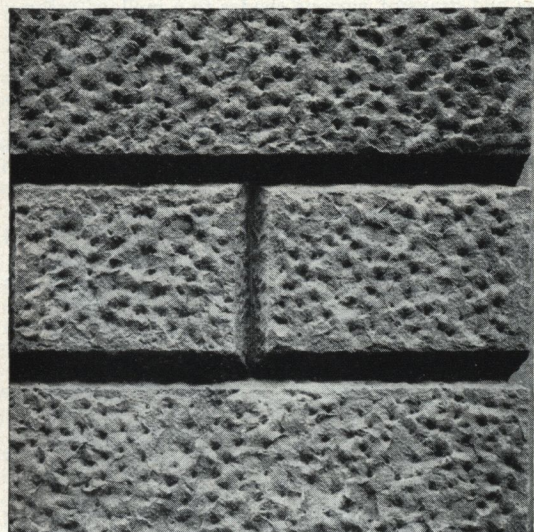
TYPICAL INDIANA LIMESTONE ASHLAR SURFACE FINISHES



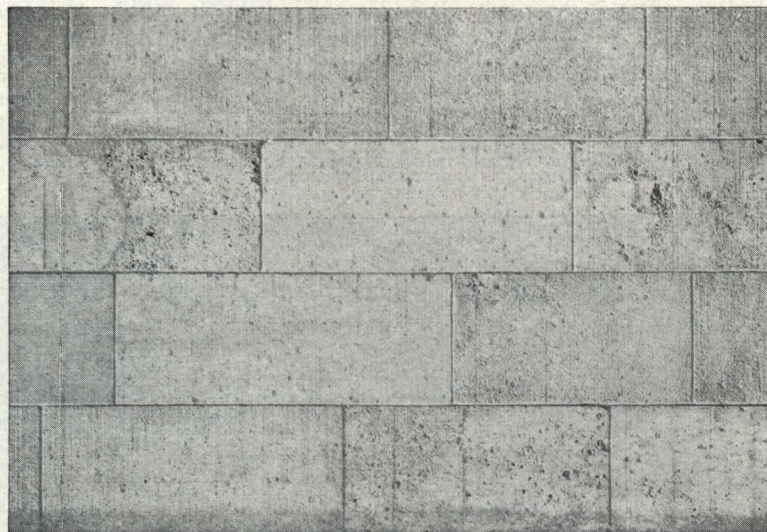
RANGE WORK
ILCO-Ripstone



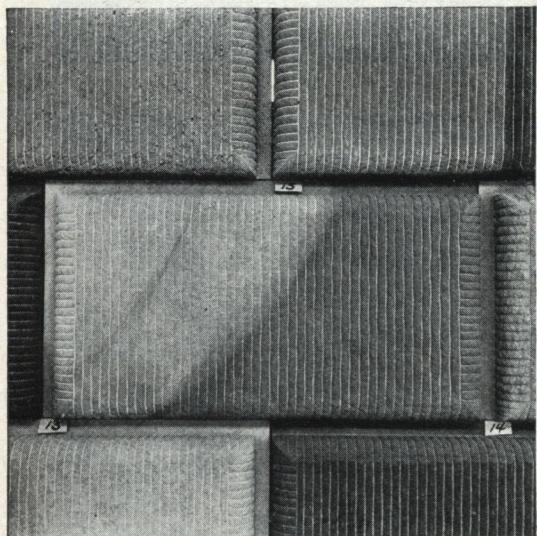
RANGE WORK
Sand-sawed Finish



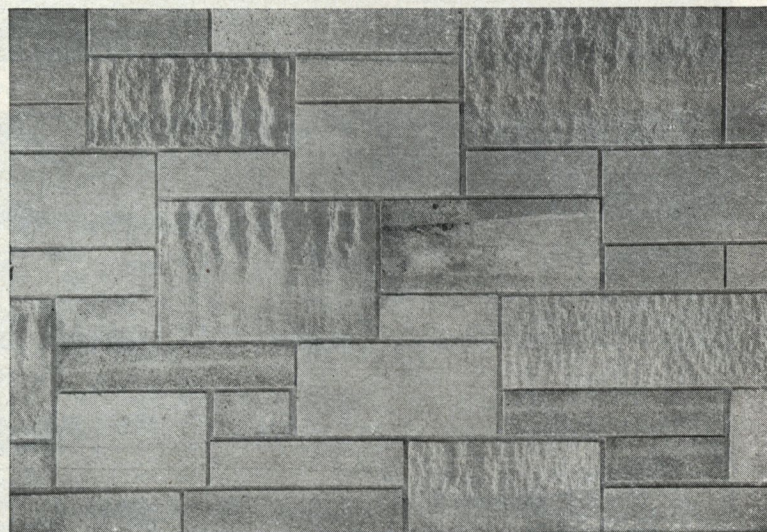
RUSTICATED ASHLAR
Course Pick-pointed Finish



COURSE RANGE ASHLAR
Pluck-planer Finish



RUSTICATED ASHLAR
Face and Edges Broached Finish



RANDOM ASHLAR
Channel-face and Sand-sawed Finish

CUT STONE—MASTER SPECIFICATION INDIANA OOLITIC LIMESTONE

PREFACE



Scope

The term "Cut Stone" is, for the purpose of this specification, confined to that product which is wholly fabricated at the mill, ready to set in the building.

Indiana Limestone furnished rough-sawn in strips, or but partially fabricated is not considered cut stone. The furnishing and laying of

this material should, therefore, be included under a separate division of the General Masonry Contract. See specifications for ILCO-Ripstone, page 19.

Drawings Required for Intelligent Estimates and Execution

Contract Drawings—The term contract drawings as used in this specification refers to the architect's drawings and details on which the cut stone contract is based.

In order to permit an intelligent and accurate estimate and proposal on the work the contract drawings should include not only complete small plans, elevations and sections showing scope and nature of the work but also sufficient large scale details to permit the estimator to determine accurately size of units, general character and amount of carving, profile or moulds, amount of bond stones, and all other required details such as jointing, special finishes, etc.

Shop Drawings—The term "Shop Drawings" refers to the shop or Cutting and Setting drawings prepared by the Cut Stone Contractor for the fabrication of the cut stone.

Full Size Details—The necessary complete Full Size Details of stone work should be furnished promptly by the architect to insure prompt preparation of "Shop drawings." Delay in this respect often disrupts the proper sequence of shipping and progress schedules.

Structural Details Required—In addition to the complete contract drawings and details, the stone fabricator should be furnished, prior to commencement of the Stone Shop Drawings, with complete structural plans, details and such *Structural Shop Drawings* of the work as may affect the cut stone work. Only so may proper clearances and fitting be provided at the mill to obviate expensive hand field dressing and fitting.

Cut Stone Specification Divisions

Since it is common practice, especially in the larger centers, to divide the Cut Stone work into two (2) distinct sub-contracts—namely, the Furnishing of the Fabricated Stone f.o.b. mill, freight allowed to destination (or delivered alongside curb at the building site), and the Setting of the Fabricated Stone, including transportation from the cars (or unloading from trucks at building site), this Cut Stone specification is separated into these two distinct divisions. This procedure is

advocated even where the Furnishing of the Cut Stone and the Setting are finally merged under one subcontract.

Note: *The clauses in parenthesis in this paragraph apply to cut stone furnished by local cut stone contractors.*

Specification Form

The form of this specification is that of a "Master," including all clauses which in ordinary practice apply to average work. All clauses, obviously, do not apply to every building. In formulating the Cut Stone Specifications for a particular building only those clauses which apply should be selected. Special provisions or methods but seldom required are not included—such clauses should be added wherever necessary to clearly define the procedure, especially to obviate controversy involving responsibility and cost.

Appendices

Following the specifications are Appendices specifically and in detail dealing with subjects forming the basis of selection of materials and methods recommended in these specifications. They contain many specification provisions affecting other trades which should be included under other divisions of the work if the Cut Stone work is to be wholly satisfactory. The inclusion of these related provisions and safeguards is of vital importance—a careful study of these Appendices is therefore recommended.

Advisory Service

The Architects' Service Bureau, maintained by the INDIANA LIMESTONE COMPANY, is at all times accessible for advice and recommendations in the formulating of Cut Stone Specifications. Special data, the result of much extended research work, relating to the fabrication and setting of Indiana Oolitic Limestone will be furnished on request.

Notes

Notes in italics are explanatory or advisory only and should not be included in the specification.

Selective Words or Phrases

Wherever words or phrases occur in the body of the specification paragraph printed in italics and enclosed in parentheses, choose that word or phrase which applies to the particular work, omitting those that are irrelevant. Wherever the word "Specify" occurs in italics enclosed in parentheses, thus (*specify*), add the particular word or clause applicable, optional with the specification writer.

CUT STONE FABRICATION

Note: For "Cut Stone Setting," see separate division, page 15.

(1) Work Included

(1a) The work under this contract shall include all labor and material for the furnishing of the Indiana OOLITIC Limestone cut stone work in accordance with the drawings and as hereinafter specified.

(1b) Delivery shall be (*f.o.b. mill, freight allowed to destination*) (*specify*).

(1c) In general, this work shall include (*list and locate items in detail*).

Note: *When the work is not clearly indicated on the drawings, or if there is any particular reason for enumerating the items, this paragraph may be included—ordinarily it is not necessary. See recommended listing of Grades and Finishes under par. (4).*

(2) Work Not Included

(2a) The following work is not included under this contract: (*list and locate items*).

Note: *Where there is Cut Stone work other than Indiana Limestone or where there is Limestone not considered "Cut Stone" and specified elsewhere under the General Masonry Contract, include this clause.*

(3) Alternate Estimate

This contractor shall include in his proposal an alternate estimate for the furnishing of Indiana Limestone in lieu of (*specify*) as follows: (*List and locate*).

Note: *Include where items indicated of other material are to be figured as well in Limestone, the comparative costs being a determining factor.*





(4) Description of Stone, Grades and Finishes

(4a) **General**—All Cut Stone included under this contract shall be Indiana Oolitic Limestone building stock quarried in Lawrence, Monroe or adjacent Counties, Indiana (by the Indiana Limestone Company).

(4a1) Stock shall in all respects fulfill the grade requirements established and adopted by the Indiana Limestone Institute and shall be from a quarry the product of which has been tested at the U. S. Bureau of Standards for physical properties and weathering with satisfactory results.

(4a2) The quarry from which the Limestone is obtained shall be one having ample capacity and facilities to assure prompt delivery in such quantities as will permit the rapid and uninterrupted execution of the work.

(4a3) This Contractor's facilities for cutting and handling the work as well as the character of Limestone Quarry will be considered in the award of contract.

Note: For large and important work it is customary and desirable to include either or both clauses (4a2) and (4a3).

(4a4) The architect reserves the right to approve the cut stone sub-contractor before the award of this work.

Note: Recommended whenever the furnishing of the Cut Stone is included under the "General Contract."

(4b) Grades and Finishes—

(4b1) All Limestone shall be (specify grade) ((specify special Trade Named variety) from the quarries of the Indiana Limestone Company or equivalent), with (Smooth Machine) (specify) surface finish.

Note: Clause (4b1) should be included only where the entire cut stone work is to be of one grade and one finish. Where there are two (2) or more grades or varieties of cut stone or two (2) or more finishes, each grade and finish should be listed and definitely located separately as below.

(4b2) **Variegated (Specify) Finish**—The following (items) (portions of the work) shall be executed in Variegated Stock (Specify special Trade Named variety) from the quarries of the Indiana Limestone Company or equivalent), with all surfaces (except as otherwise indicated or specified) finished in (Smooth Machine) (specify) finish.

Note: Here list and locate the items or portions of the work. Particular attention is called to the "Adaptability" suggestions for both "Grades" and "Finishes" given under these separate headings on pages 5 and 8 respectively. Note particularly the advocated use of the "Special Hard" varieties, par. (7) and "Wet Rubbed Finish," par. (5). See par. (10), page 6 for "Special Varieties of Stone Produced by Indiana Limestone Company."

Note: Continue other clauses similar to (4b2) specifying other grades and finishes.

(4b3) **Special Tooling and Finishes**—In addition to the general surface finish(es) above specified, the following items shall have (special tooling) (finishes) as described below:

Note: Here list, locate and describe. See particularly paragraphs (8), (10) and (11), page 8.

(4b4) Alternate Estimate—

Note: Describe the grade of stone, finish, etc. required for alternate estimate (see par. (3)) following substantially the same outline as suggested in (4b2).

(5) Samples

(5a) (Prior to) (Immediately after) the award of contract, the contractor shall submit to the architect for approval two (2) (except as noted below) samples of (the grade) (each grade) of stone specified, illustrating the extremes which are to be furnished under this contract.

(5b) In the case of "Statuary Buff" one sample will suffice.

(5c) In the case of "Variegated" three samples are required.

(5d) In the case of "Old Gothic," (specify number) samples are required.

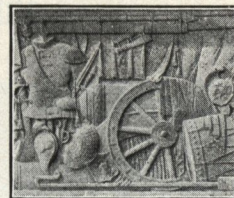
Note: See par. (1), "Grading," page 5 in reference to (5a), (5b), (5c) and (5d).

(5e) Samples shall be approximately 3½ in. wide x 7 in. long x ¾ in. thick, produced with the large faces cut across the grain of the stone and one large face finished to correspond with (that) (those) specified. At least two (2) edges shall be rock face.

(5f) All samples shall be marked "Sample of Indiana Limestone for (specify) Building" including Grade, Finish and Contractor.

(5g) Stone shall be of the same grade, color and finish as the (specify) building at (specify) (except [specify exceptions]).

Note: Often more satisfactory than basing contract on samples.



(6) Shop Drawings

(6a) Prior to fabrication, This Contractor shall prepare and submit in (triplicate) (specify) for the approval of the architect, complete "Shop" drawings for all Cut Stone work under this contract as indicated on the contract drawings and specifications and no stone shall be cut until these drawings are approved.

(6b) A sufficient number of copies of approved shop drawings shall be furnished for (the Cut Stone Setting Contractor) (and) other trades for the co-ordination of their work with the cut stone work.

(6c) Shop drawings shall show accurately in detail the dimensions and sections of stone, the jointing, bonding, special anchoring and the support of stone by shelf angles and loose steel and other necessary structural details and shall conform to the contract drawings and specifications and to the general provisions governing the fabrication as set forth in par. (7).

(6d) All stone work shown on the Cut Stone shop drawings shall be detailed to leave at least a full (1 in.) (specify) clearance between the back of the stone and the ultimate face of (reinforced concrete work) (concrete floor construction) (fire-proof covering over structural steel).

Note: Due to unavoidable inaccuracies, slight bulging of forms, etc., which often advance the theoretical face of these rough members, a clearance of 1½ in. is often allowed to assure the prescribed, necessary 1-in. clearance. Clearance of more than 1½ in. is not recommended.

(6e) In no case shall the contractor deviate from the jointing shown on the architect's drawings and details without written approval.

Note: Include only where the jointing has been accurately and carefully worked out on the contract drawings, not only on small scale drawings, but as well on complete typical large scale details.

(6f) No departure from the architect's drawings shall be indicated on the shop drawings submitted for approval, unless the change is specifically called to the architect's attention by a note on the shop drawings or an accompanying letter of explanation.

Note: Recommend in lieu of clause (6c) in the great majority of cases where the experience of the Cut Stone contractor may be relied upon to suggest only changes or departures from the architect's drawings which are beneficial or fall within more practical limits of the material.

(6g) Each stone on shop drawings shall be numbered and the fabricated stone shall bear the corresponding identification numbers marked on the back or bed with non-staining paint.

(7) Fabrication—Cutting

(7a) **General**—All stone work shall be accurately cut to shape and dimensions shown on the approved shop drawings. All exposed plane faces shall be true. Beds and all joints shall be dressed straight and, unless otherwise shown, at right angles to the face. All arrises shall be sharp and true, with the fragile edges slightly rounded to prevent "snipping." Patching of stones will not be permitted except with consent of the architect.

(7b) **Ashlar**—Ashlar in general shall be (4 in.) (specify) thick with (8 in.) (specify) bond courses and (8 in.) (specify) heads on external angles, a net variation of ¼ in. in thickness of ashlar being allowed.

Note: The difference in thickness between ashlar and bond stones or bond courses should normally be 4 in., one brick width.

(7b1) Every (other) (third) course shall be a bond course.

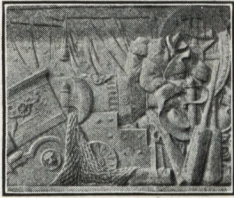
Note: In average work every third course is sufficient. Check with local Building Code.

(7b2) Every other stone in alternate courses shall be a bond stone.

Note: Ample sufficient for stability. Check with local Building Code.

(7b3) (Fifteen) (specify) per cent of the superficial area of the wall shall be bond stones and these shall be uniformly distributed over the surface.

Note: Recommended by the Building Officials Conference, 1925, as sufficient.



(7b4) There shall be (one) (two) (three) bond courses to each story height.

Note: Sufficient for enclosure walls on structural frame buildings. Check with local Building Code.

(7b5) Provide "through" or bond stones wherever indicated on the Architect's contract drawings.

(7b6) Reprises at internal angles shall have (4-in.) (6-in.) (specify) returns.

Note: Use only on special work where the considerable added expense involved is warranted.

(7c) **Projecting Stones**—All projecting stones, except where specially detailed on the shop drawings as anchored to the structure, shall have beds in the wall at least 1 in. greater in depth than their maximum projection.

(7c1) Moulded projecting courses, unless specially shown as secured by suitable anchorage or steel supports, shall have not less than four-sevenths (4/7) of their cubical contents inside the face of the wall.

(7d) **Washes**—All washes shall be cut in strict accordance with details, true to line and to match perfectly at joints.

(7d1) Unless otherwise specially shown, all washes shall be cut with lugs or seats to receive masonry work above.

Note: See Recommendations as to the pitch of wide washes in the last clause of par. (1) page 22 of appendix E.

(7e) **Drips**—On all projecting stones and courses, provide drips of sufficient width and depth to shed water as shown on the contract drawings.

(7e1) Unless otherwise specifically indicated, all (copings) (caps) (sills) (specify) etc. shall overhang the work below not less than (1½ in.) (specify) and shall be provided with drips.

Note: The modern trend of design in the eliminating of these projecting members with drips results in much unsightly streaking especially beneath sills. Drips therefore are strongly advocated. Where drips cannot be provided, washes should be as steep as possible.

(7f) **Joints**—Joints shall have a uniform thickness of (¼ in.) (specify).

Note: ¼ in. is standard and recommended.

(7f1) In some instances, the drawings show stones cut in large pieces with false joints. False joints shall be cut (¼ in.) (specify) wide and (⅝ in.) (specify) deep.

(7g) **Moulded Work**—All moulded work shall conform accurately to profiles given on full sized details and shall match perfectly at joints. All intersecting profiles shall be cut with returns with their lines carefully connected (except where miters are specifically called for on the approved shop drawings).

(7h) **Curved Work**—All curved work shall be cut to correct radii with joints on true radial lines.

(7i) **Reveals**—Reveals shall (unless specially otherwise shown) show full heads. The returns against (frames) (masonry) (specify) shall be dressed approximately smooth and true.

(7j) **Lintels, etc.**—All stone (lintels) (voussoirs of arches) (keys) etc. shall be the full depth of reveals. The returns against (frames) (relieving arches) (steel) (specify) shall be dressed approximately smooth and true.

(7j1) Lintels, unless specially otherwise shown, shall be at least (8 in.) (specify) longer than the figured width of opening covered.

(7k) **Sills**—All sills (except slip sills) shall be cut with (lugs and) wash in strict accordance with details.

(7k1) They shall, unless otherwise shown, be (6 in.) (specify) longer than figured width of opening. The width shall be such that (in addition to the projecting face) they shall be at least (2 in.) (specify) wider than figured depth of reveal.

(7k2) Unless otherwise shown, all window sills shall overhang the work below not less than (1½ in.) (specify) and shall be provided with (¾ in.) (specify) drips.

Note: See par. (7e).

(7k3) All window sills shall be plowed for water bars.

(7k4) Door sills shall be provided with accurately cut thresholds or lips as detailed.

(7k5) Slip sills shall be cut to fit reveals, allowing for (¼ in.) (specify) joints at ends.

(7l) **Columns and Pilasters**—(Columns) (engaged columns) (pilasters), etc. shall be cut with (entasis) (flutes) (caps) (bases) etc. in strict accordance with the detail drawings.

Note: Entasis is not customary or recommended on pilasters, especially when fluted.

(711) Column shafts shall be (monolithic) (cut into the number of drums detailed).

Note: Column shafts up to 12 ft. in height generally cost no more monolithic than in drums. For the average column up to 24 ft. or more in height three sections or drums are recommended. It is inadvisable to joint the columns in drums to correspond with the ashlar courses.

(712) (Pilasters) (and) (engaged columns) shall have alternate stones sufficiently thick to bond (4 in.) (8 in.) into the masonry backing.

(7m) **Steps, Platforms, Etc.**—Steps shall be cut with riser and treads of dimensions detailed, with a lap of (2 in.) (specify) wider than the width of tread.

(7m1) All steps and platforms shall have at least (4 in.) (specify) bearing on bridge and cheek walls.

Note: For special requirements, consult the Architects' Service Bureau.

(7n) **Clearance**—A minimum clearance of 1 in. shall be maintained between the back of stonework and the face of (fireproof covering of structural steel) (reinforced structural members).

(7o) **Raglets**—Raglets for flashing, etc. shall be cut in the stone of sizes detailed where indicated.

Note: See par. (3) page 23 of Appendix E.

(8) Back Checking and Fitting to Structural Frame

Stone coming in contact with structural work shall be back-checked as detailed on the approved shop drawings, and where shown resting on structural work shall have beds accurately shaped to fit the supports.

Note: In requiring back checking for structural work, the architect should see that the requirements of his drawings are not such that will impair either the lateral strength or bearing capacity of the stone. In no case should stone that has been channeled out for structural steel or reinforced concrete be filled with concrete or cement mortar or be detailed in such a manner that, when erected, expansion or deflection under load of the structural work will tend to split the stone.

(9) Models

Note: The location and general character of all carving should be shown and noted on the contract drawings. Where models are required they can best be identified by model numbers on these drawings. These numbers can then be listed in the specifications.

(9a) All carving (unless otherwise specified) shall be executed from plaster models.

(9b) Where models are required for carved (or sculptured) parts, they are designated by numbers on the contract drawings.

(9c) Models (designated by numbers on the contract drawings) (listed below) shall be furnished by this contractor and made by a modeler of his selection. They shall be carefully executed from the sketches and details furnished by the architect. Adequate photographs of the work in the clay shall be submitted to the architect for approval. Models shall not be cast in plaster until final approval and acceptance of the work in the clay.

Note: This method is successfully used on average work of average size.

(9d) This contractor shall allow the sum of \$..... to cover the cost of models (listed below) made under the architect's direction and supervision by a modeler to be (selected) (approved) by him. The above sum includes the cost of crating, shipping and delivery to the contractor's mill (or the building site as may be determined upon).

Note: This method is advocated on the larger, more important work.

(9e) All models shall be shipped to the plant where the cut stone is fabricated.

Note: Even where carving is done at the building site, models are necessary for making shop drawings, and roughing out the stone.

(10) Carving

(10a) All carving (unless otherwise specified) shall be executed by skilled carvers in strict accordance with the spirit and intent (of the architect's detail drawings) (and) (or) (from plaster models (provided) (and) (or) (approved) by the architect).





(10b) This contractor shall allow the sum of \$.....to cover the cost of carved sculptural work as (listed below) (shown and noted on the contract drawings) to be executed by a sculptor selected by the architect.

Note: Here accurately list such sculptural work, unless shown and noted on contract drawings.

(10b1) This sculptural work will be executed at the building after the stone has been set.

(10c) Wherever carved (or sculptural work) is to be executed at the building after the stone has been set, this contractor shall provide sufficient stock projecting beyond the normal line or face to assure proper execution of the sculptural detail in accordance with the (architect's) (sculptor's) explicit directions.

(10c1) This contractor shall rough out the (carved) (sculptural) work to be executed at the building. This shall only be done from (models) (full size details) furnished by the (architect) (sculptor) for this purpose.

(11) Inscriptions

All lettering (and inscriptions) shall be accurately executed from the architect's full size details.

(11a) The following shall be included:

Note: Here list lettering and inscriptions to be cut. It is customary where complete lettering is not shown on the drawings for estimate that the character and number of letters required shall be indicated.

(12) Cornerstone

(12a) The contractor shall furnish as located on the contract drawings a stone of shape and dimensions detailed for a cornerstone.

(12b) The top bed of the stone shall be centrally cut out to permit the insertion of a copper box approximately (specify size). The upper edge of the recess shall be cut with a rebate below the top of the bed to permit the insertion of a 2 in. thick slab of limestone which is to be cemented in over the copper box.

(12c) The bottom bed of the stone shall be centrally cut out to permit the insertion of a copper box approximately (specify size).

Note: Select either (12b) or (12c) as desired.

(12d) The face(s) of the stone shall be cut with the dates and inscription(s) (detailed) (described and listed below).

(13) Incidental Cutting, Drilling, Etc.

Note: Correlate with par. (27), page 16 of "Cut Stone Setting" division.

(13a) Cutting for Anchors, Dowels, Cramps, Etc.—Cut holes and sinkages in stones for all anchors, cramps, dowels, etc., called for under this specification or indicated on the shop drawings.

(13a1) All ashlar and other stone forming wall facing of every description, including moulded work, shall be securely anchored to the backing masonry with ($\frac{3}{8}$ x1 in.) ($\frac{1}{4}$ x1 $\frac{1}{4}$ in.) (specify) flat steel anchors (or round anchors of equivalent cross-section) turned down at least $\frac{3}{4}$ in. and countersunk below the top of the stone. All such anchors shall extend at least (8 in.) (specify) into the backing and be turned up 2 in.

Note: The $\frac{3}{8}$ x1 in. ashlar anchor is the standard anchor for all ordinary work. For heavy monumental work or where a heavier anchor is desired, the $\frac{1}{4}$ x1 $\frac{1}{4}$ in. should be specified. Anchors made from $\frac{1}{8}$ x $\frac{7}{8}$ in. cold rolled strap iron may be more economical and are satisfactory for most work.

(13a2) There shall be at least two (2) anchors to each stone over 2 ft. long or 3 sq. ft. in face area.

(13a3) Anchor holes shall be placed not less than 1 $\frac{1}{4}$ in. from the back or ends of any stone.

Note: This clause will apply to all cut stone facing 4 in. or more in depth and thus should be included in practically all specifications covering exterior work. For anchorage of interior work 2 in. or 3 in. thick consult the Architects' Service Bureau.

(13a4) Anchors are not required in bond stones, or in trim, belt courses, etc. which extend into the wall (8 in.) (specify) or more except where stones do not "balance."

Note: See par. (7c) and (7c1), page 13.

(13a5) All blocks of stone listed below shall be tied together with cramps, the tops of which shall be set a full ($\frac{3}{4}$ in.) (specify) below the top surface of the stone. See (27c) page 16.

Note: List specifically here and indicate on contract drawings, copings, rails, imposts and similar stone requiring cramps.

(13a6) All stones listed below shall be secured in position with dowels.

Note: List specifically here and indicate on contract drawings, balusters, rails, coping and similar stone requiring dowels. See (27d), page 16.

(13b) Lewis Holes—Lewis holes shall be cut in all stones weighing more than 200 pounds. No Lewis hole shall be cut in exposed portion of the work, except with written permission.

(13c) Cutting and Drilling for Other Trades—This contractor shall do all cutting and drilling of stone for (electric conduits) (piping) (leaders) (metal windows and doors) (specify), etc., required for the installation of the work of other trades when necessary information is furnished in time to be shown on the shop drawings and details for the cut stone work.

Note: All cutting and drilling in the field is much more expensive than that executed at the fabricating mill. When properly detailed, a minimum of field cutting is required.

(13c1) Drilling and cutting incident to the installation of the following items are not included in this contract.

Note: Here list such items. Some work such as the drilling of stone for metal railings, lamp or other standards, thresholds, metal door and window frames, bronze tablets or lettering, etc. should generally be done after setting of the cut stone at the expense of the contractor doing the metal work.

(14) Field Cutting

Note: Specify in detail any field cutting that will be required. Omit this heading under this division if the field cutting is to be executed by the "Setting Contractor." See also par. (10c).

(14a) This contractor shall furnish a fitter who shall remain on the work and do any cutting and fitting required during the entire period of setting.

Note: Seldom required or warranted except on large complicated work.

(14b) This contractor shall do all cutting and fitting in the field necessary to overcome any inaccuracies in his work or to make the work conform to conditions of the building. A sufficient number of experienced men to do all necessary field cutting shall be kept on the work during the setting period.

Note: For use on important or difficult work where field cutting is considered necessary.

(14c) This Contractor shall be reimbursed by the General Contractor for all cutting and fitting in the field necessary to overcome inaccuracies in the work of others.

(15) Loading and Shipment

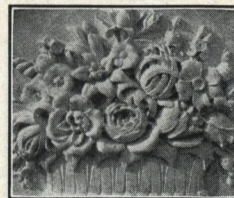
Note: Correlate with provisions of par. (1), page 11.

(15a) The Cut Stone shall be carefully packed for transportation to destination with the exercise of all reasonable and customary precautions against damage in transit.

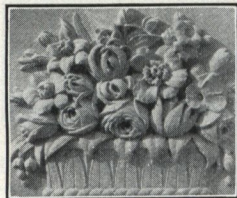
Note: The boxing or crating of stone, while sometimes specified, is here purposely omitted due to the added and often unnecessary expense. It is best to simply require that the stone be carefully loaded as above, leaving it to the judgment and experience of the Cut Stone contractor as to the necessity of boxing such pieces as carved or other ornamental work.

(15b) All cut stone shall be delivered promptly when ordered in accordance with the contract schedule and in the sequence in which it is to be set.

(15c) The (General Contractor's) (Architect's) representative will inspect each shipment of stone on its arrival and notify this contractor in writing of any damage and this contractor shall proceed with the immediate replacement of such pieces. The responsibility for the cost of such replacement shall be determined by the point of delivery fixed by the contract under which the stone is delivered. When the point of delivery is beyond the immediate control of this contractor the (general) (setting) contractor shall assume responsibility for the necessary proof of damage.



CUT STONE SETTING



Note: For "Cut Stone Fabrication" see separate division, page 11.

Note: For "Preface" to the specifications, see page 11.

(16) Work Included

The work under this Contract shall include all labor and material for the Setting of the Indiana Limestone Cut Stone Work specifically mentioned in paragraph (1) of the "Cut Stone Fabrication" specifications.

Note: See page 11.

(17) Work Not Included

This Contract does not include the setting of Cut Stone Work specifically excepted under paragraph (2) of the "Cut Stone Fabrication" specifications.

Note: See page 11. If par. (2) is not included, omit this par. (17).

(18) Alternate Estimate

This Contractor shall include in his proposal an alternate estimate for the Setting of Indiana Limestone included in paragraph (3) of the "Cut Stone Fabrication" specifications.

Note: See page 11. If par. (3) is not included, omit this par. (18).

(19) Correlative Specifications

(19a) This Contractor shall familiarize himself fully with the provisions of the specifications covering the "Cut Stone Fabrication" division of this specification.

(19b) He shall also refer to the (other) (General Masonry) (Structural Steel) (Reinforced Concrete) (Carpentry) (Roofing) (Sheet Metal Work) (specify) divisions of the General Contract specifications and familiarize himself with the materials and labor furnished by others to facilitate or supplement conjointly the work under this contract.

(20) Co-operation

This Contractor shall co-operate with all other trades to the end that the Cut Stone Setting will conform to the general progress of the structure with the least interference possible.

(21) Derricks, Hoists, Etc.

(21a) All derricks, hoists, etc. for the (unloading) (storage) (and) (setting) of the Cut Stone at the (storage) (and) (building site) will be furnished by the General Contractor.

(21b) This Contractor shall furnish, erect and remove at his own cost and risk all derricks, hoists and equipment required for the expeditious (unloading) (storage) (and) (setting) of the Cut Stone work.

Note: Select either (21a) or (21b) as may apply.

(22) Delivery and Storage

Note: Correlate these provisions with those of par. (1), page 11.

Note: Not only damage but discoloration sometimes very difficult to remove may result from a careless handling of cut stone during delivery and storage. Rigid observance of the requirements in this paragraph will prevent costly and annoying replacements and delays.

(22a) All Indiana Limestone delivered (f.o.b. cars at destination) (at curb at building site) shall be carefully unloaded and delivered it to the (storage) (and) (building) site.

(22b) The Cut Stone shall be handled throughout by competent workmen and by such methods as will guard against soiling, mutilation or snipping (in transit to and) upon delivery at the (storage) (and) (building) site.

(22c) Stone shall be stored (specify) (and) (at the building site) (where designated) (by the General Contractor) (specify), on planking so set that the stone will rest entirely clear of the ground. Provide adequate protection from damage to arrises and from contact with anything which would result in the accumulation of dirt, dust, soot, mud, grease or other staining or disfiguring elements. The stone shall be covered with (tarpsaulin) (strong, non-staining waterproof paper) (or)

(boards) during extended periods of storage at (destination) (and) (building site).

(22d) All planking and lumber required for the fulfillment of the provisions above will be furnished by (others) (this Contractor) (specify).

Note: If furnished by others, include the requisite clause under the "Carpentry" or other specification division.

Note: Stone is generally stacked in the same position in which it is set in the wall. Ashlar may, however, be stacked flat to save space, in which case it should be placed back to back and face to face. The faces are then separated by wood cleats or lath; but stone thus stored for extreme periods will develop drying out marks which will disappear only after a considerable time. Consequently, stacking on edge is safer as well as more convenient. For cleats use cypress, white pine, poplar, yellow pine without an excessive amount of resin. Rigorously avoid chestnut, walnut, oak, certain firs and other woods containing tannin.

(23) Scaffolding

(23a) The scaffolding required for the use of all trades, including that for the proper execution of work under this Contract will be furnished and erected by the (General Masonry Contractor) (specify).

Note: Include the requisite clause under the General Masonry or other specification division.

(23b) Adequate scaffolding and protective housings for the use of (carvers) (and) (sculptors) for the execution of carving at the building after the stone has been set will be provided by (the Carpentry Contractor) (specify).

Note: Correlate with par. (10b) and (10c) page 14 of the "Cut Stone Fabrication" division. Include the requisite clause under proper specification division.

(23c) Scaffold for Corner Stone—The (Carpentry Contractor) (specify) will furnish and erect a suitable platform and other frame structure required for the laying of the corner stone and every facility will be provided the Cut Stone Setting Contractor in connection with this ceremony.

Note: Include the requisite clause under the Carpentry or other specification division.

(24) Centering

(24a) All wood centering required for the setting of cut stone under this contract will be furnished, erected and removed by the (Carpentry Contractor) (specify).

Note: Include the requisite clause under the Carpentry or other specification division.

(24b) This Contractor shall inspect all centering and shall report (to the architect) (specify) any centering of insufficient strength or unsuitable for its purpose.

(24c) Centers shall not be removed until the mortar has sufficiently set to render the work self-supporting.

(25) Setting Mortar

Note: Both theory and experience indicate that the most satisfactory results are obtained by setting cut stone facing and masonry backing in one mortar selected to meet the particular requirements of the individual building. This is not necessarily more costly than using two or more kinds of mortar and greatly simplifies construction work.

Note: See Appendix A, page 20 and par. (1), page 22 of Appendix D.

Note: The following three (3) types of mortar are recommended for setting limestone. The type best adapted to the particular work should be selected and included.

(a) **Non-staining Cement Mortar**—Both theory and extensive field practice prove that under ordinary conditions eminently satisfactory results are obtained when this type of mortar is employed in setting both facing and masonry backing. The proper backing mortar should therefore be provided for in the masonry specification.





(b) Non-staining Cement-lime Mortar—While this mortar has not been as widely used on large building operations and its use is not always permitted by city building codes for the highest type construction, it has given general satisfaction when used for setting both facing and masonry backing. Many ready mixed and so-called masons' mortars really belong in this class, some of which have been widely used with satisfactory results.

(c) Waterproof Non-staining Cement Mortar—Recommended whenever parging is required; for setting cut stone when masonry backing is laid up in ordinary staining cement mortar or when any of the construction materials such as water, sand, brick, tile, etc., are known to contain salts which may cause staining or efflorescence; and for walls exposed to excessive amounts of moisture. These conditions, all of which have a tendency to produce staining and efflorescence, should be avoided whenever possible. When such conditions are unavoidable, the waterproof nonstaining cement mortar should be used.

(25a) General—All Indiana Limestone shall be set in carefully prepared non-staining mortar consisting of materials and mixtures specified below.

(25b) Materials—

(25b1) Non-staining Cement—(Specify) (brand) made by (specify manufacturer) or equivalent, subject to the architect's approval. Non-staining cement shall in no case contain more than 2% of soluble alkali (calculated as Na_2O).

Note: The INDIANA LIMESTONE COMPANY will furnish data on non-staining cements which have fulfilled the above qualifications under test.

(25b2) Non-staining Waterproof Cement—(Specify) (brand) made by (specify manufacturer) or equivalent subject to the architect's approval. Waterproof cement shall contain not less than 2% of integral waterproofing compound ground with the cement. The integral waterproofing shall be water repellent, soap type which will prevent the passage, through the setting mortar, of staining elements from the backing material into the stone.

Note: The INDIANA LIMESTONE COMPANY will furnish complete data on integral waterproofing compounds and waterproofed cements which have been tested for the above qualifications.

(25b3) Hydrated Lime—Hydrated lime shall fulfill the requirements of the standard specifications of the American Society for Testing Materials.

(25b4) Lump Lime—Lump lime shall fulfill the requirements of the standard specifications of the American Society for Testing Materials.

Lump lime shall be reduced to a paste by thorough and complete slaking with cold water and screening through a $\frac{1}{8}$ in. mesh screen into a settling box. Lime putty shall stand in the settling box not less than one week before use.

(25b5) Sand—Sand shall be clean and sharp, free from loam, silt, vegetable matter, salts and all other injurious substances, with grains graded from fine to coarse. Screen through a 6-mesh screen.

(25b6) Water—Water shall be clear, non-alkaline and devoid of salts or other injurious elements.

(25c) Mixtures—

(25c1) Non-staining Cement Mortar—Cement mortar shall be composed of one (1) part of non-staining cement to three (3) parts of sand with the addition of one-fifth ($\frac{1}{5}$) part of hydrated lime based on the volume of the cement used.

(25c2) Non-staining Cement-lime Mortar—Cement-lime mortar shall be composed of one-half ($\frac{1}{2}$) part of non-staining cement, one-half ($\frac{1}{2}$) part of (hydrated lime) (lump lime paste) to not to exceed three (3) parts of sand.

Note: Select either hydrated or lump lime.

Note: Add the following clause (a) if lump lime paste is specified.

(a) First thoroughly mix the lump lime paste and sand and stack to age; the cement shall be added and thoroughly worked into the lime and sand mixture in small batches just prior to use.

(25c3) Non-staining Waterproof Cement Mortar—Non-staining waterproof cement mortar shall be composed of one (1) part of non-staining waterproof cement to three (3) parts of sand with the addition of one-fifth ($\frac{1}{5}$) part of hydrated lime based on the volume of cement used.

(25c4) Retempering—Mortar shall be mixed only in such quantities as are needed for immediate use. No rettempering

will be permitted and materials which have been mixed for a period exceeding thirty (30) minutes shall in no case be used upon any portion of the work and must be thrown upon the dump.

(26) Pointing Mortar and Grout

(26a) General—All Indiana

Limestone shall be pointed or grouted with carefully prepared non-staining mortar, consisting of materials and mixtures specified below.

(26b) Materials—

(26b1) Non-staining Cement—Non-staining cement shall be as specified in par. (specify) above.

Note: If non-staining cement is not specified in par. (25) above, copy here the full text of par. (25b1).

(26b2) Lime—Lime shall be (hydrated) (lump lime) as specified in par. (specify) above.

(26b3) Sand—Sand shall be white sand, otherwise it shall be as specified above in par. (specify) above.

(26b4) Water—As specified in par. (specify) above.

(26c) Mixtures—

(26c1) Pointing Mortar—Pointing mortar shall be composed of one (1) part of non-staining cement to not to exceed two (2) parts of white sand to which shall be added sufficient (hydrated lime) (lime putty) to make as stiff a mixture as can be worked.

Note: Select either hydrated lime or lime putty.

(26c2) Grout—Grout shall be composed of one (1) part of non-staining cement to not to exceed one and one-half ($1\frac{1}{2}$) parts of fine white sand, mixed in small quantities of as thick a consistency as can be poured into the joints. Grout shall be stirred vigorously until used.

(26c3) Retempering—As specified in par. (specify) above.

(27) Anchors, Dowels, Etc.

(27a) General—The shop drawings as provided in par. (specify—see par. 6, page 12) of the "Cut Stone Fabrication" division require the location and detailing of all anchors, etc. All holes and sinkages in stones for all anchors, cramps, dowels, etc., and all Lewis holes are provided for in par. (specify—see par. 13, page 14) under the heading of "Incidental Cutting, Drilling, Etc.," of the "Cut Stone Fabrication" division.

This Contractor shall furnish and set all anchors, cramps, dowels, etc., shown on the approved shop drawings or that may be required to carry out the evident intent of par. (specify—see par. 13, page 14) of the "Cut Stone Fabrication" division.

All steel anchors, cramps, etc., shall be thoroughly galvanized after they have been bent.

Note: Asphalt coating of metal, sometimes resorted to, is not recommended in the better work. The added cost of galvanizing constitutes such a small item of expense compared with the benefits derived through assurance of permanent rust prevention that galvanizing as above is strongly advocated. Rust from anchors may cause streaks or blotches of rust stain on the stone often almost impossible to eradicate. Rusting anchors may also split the stone.

(27b) Anchors—Anchors shall be ($\frac{3}{8}$ x 1 in.) ($\frac{1}{4}$ x $1\frac{1}{4}$ in.) (specify) flat steel anchors (or round anchors of equivalent cross section) turned down at least $\frac{3}{4}$ in. into the stone, extending at least (8 in.) (specify) and turned up 2 in. into the backing.

Note: Correlate with paragraphs (13a1) and (13a2), page 14.

(27c) Cramps—Cramps where required shall, unless otherwise detailed, be of ($\frac{3}{8}$ x 1 in.) (specify) (steel) (specify) turned down at least ($1\frac{1}{2}$ in.) (specify) at each end and span at least (8 in.) (specify) on the flat.

Note: Cramps are sometimes dropped into sinkages on top of stone but on heavy stone work are generally set underneath with the ends turned up into cuts in the underside of stone. Cramps should always be galvanized—they are not recommended for baluster rails and light copings or light stone work.

(27d) Dowels—Dowels shall, unless otherwise noted, be of heavy (brass pipe) (specify) of diameters and lengths detailed.

Note: The best dowels for balusters, baluster rails, mulions and all ordinary light work are made of $\frac{1}{2}$ in. heavy brass pipe about 3 in. long. Where smaller dowels are necessary in slender work, such as tracery, $\frac{3}{8}$ in. solid brass or bronze pins should be used.





(27e) Lewis Anchors — This Contractor shall provide all Lewis or suspension anchors of size and design detailed.

Note: *Wide lintels and horizontal members that must be supported by steel work above (this should be avoided whenever possible) should never be supported with expansion bolts. Always use Lewis anchors*

of the number and size required for safe support. Two large-size, well placed Lewis anchors are often preferable to four smaller ones. Never should more than four be used in a single stone and these placed two at each end. It is not practicable to so hang with Lewis anchors stone less than 6 in. in depth. For smaller stones cinch anchor bolts or equivalent may be used.

(27f) Special Anchors—

Note: *Here describe any special anchors required, such as anchor bolts with top plate or washer for the anchoring down of large projecting stones, etc.*

(28) Grade Course

Limestone grade courses shall not be set until the foundations have been adequately waterproofed or otherwise protected by others against the danger of staining due to capillarity.

Note: *Where grade courses are of limestone the tops or recesses in the foundations should be thoroughly and permanently through-waterproofed with non-staining materials. Omission of this provision usually results in unsightly staining of the base course due to the soluble alkali salts in the foundation masonry (particularly if of concrete) being drawn up into the stone work. Provide this safeguard in the waterproofing or other appropriate specification division. (See Appendix B, page 20.)*

(29) Concrete Surfaces

All concrete surfaces, shelf angles, etc., against which limestone is to be applied as a facing material shall be coated with an impervious waterproof coating applied by others. This Contractor shall inspect all such work and shall report (to the architect) (specify) prior to the setting of the stone any portions not adequately so protected and thus subjecting the cut stone to the danger of stains.

Note: *This procedure is strongly recommended (see par. (2a) page 22 of Appendix D). Provide for this painting under the proper specification division.*

(30) Corner Stone

Note: *Correlate with par. 12, page 14.*

(30a) This Contractor shall set the corner stone provided in par. (specify—see par. 12, page 14) of the "Cut Stone Fabrication" division.

(30b) Set in non-staining cement mortar the 2-in. thick slab of limestone in the rebate provided for it over the recess containing the copper box.

Note: *Use this clause if clause (12b) page 14 is selected.*

(30c) The corner stone shall be set in a full bed of non-staining cement mortar.

(30d) At the conclusion of the ceremony, this Contractor shall build at least three courses of the exterior face stone work and the (brick) (specify) backing (provided by others) to the same height on top of the corner stone in quick-setting, non-staining cement mortar. Stone work shall be set as hereinafter specified with the joints raked out to a depth of $\frac{3}{4}$ in. for future pointing. Protect top of wall from damage by weather.

Note: *This clause is to prevent tampering with the record where recess is cut in the top of corner stone requiring rebate and the inclusion of par. (30b). In any case it is better when possible to set corner stone after walls are started, thus permitting immediate sealing with additional masonry work.*

(31) Damaged Stone

(31a) Only satisfactory stones shall be set in the walls.

(31b) Any stone showing flaws or imperfections in cutting, bruises or defects of any kind, when delivered on the site, shall not be set, but shall be referred to the architect (or his authorized representative) for determination as to responsibility and decision as to whether the stone shall be entirely

rejected, made satisfactory by redressing or re-cut for another position in the wall.

(31c) Patching of stone of any description will not be permitted.

(31d) Should any damaged or defective stone be set in the wall, it is distinctly at this Contractor's risk and may, whenever discovered, be condemned, removed and replaced with a satisfactory stone, to the end that all of the work shall, upon completion of this contract, be acceptable in every detail.

(32) Incidental Field Cutting, Drilling, Etc.

Note: *Correlate with par. (14), page 14 of the "Cut Stone Fabrication" division. Include here any provisions for field cutting not included under the "Cut Stone Fabrication" division.*

(32a) Incidental cutting, dressing, drilling, etc., shall be done by skilled workmen before the stones are set. Only under unavoidable conditions will the drilling, dressing of stone (other than carving) on the wall be permitted.

(32b) The drilling of stone for (metal railings) (lamp or other standards) (thresholds) (metal door and window frames) (bronze tablets) (bronze lettering) (hardware) (specify) shall be accurately executed by this Contractor, the cost thereof to be paid by the contractor installing these items.

Note: *Include correlative clause under proper specification divisions to provide for this cost item. It is recommended that such drilling be done by a skilled stone cutter rather than by a mechanic of another trade.*

(33) Back-Painting

Note: *The back-painting of stone is intentionally omitted from this specification as painting the sides and back of stone with bituminous waterproof compounds is strongly condemned. For full information regarding waterproofing of stone generally, see pages 20 and 21 of Appendix B.*

(34) Setting

(34a) All Indiana Limestone shall be accurately set in strict accordance with the contract drawings and the subsequently approved shop drawings.

(34b) Before setting, all stones shall be cleaned on all side by (an approved steam cleaning process) (or) (washing clean, using when necessary fibre brushes and soap powder) followed by a thorough drenching with clean water.

Note: *It is not sufficient to simply dip the stone in water or run a hose stream over it. It should be washed clean of all dirt and foreign matter of every kind. Clean stone and proper setting mortar are imperative to assure a building that will dry out to a beautiful clear light color.*

(34c) (Except in freezing weather) just prior to the setting, all stone not thoroughly wet shall be sponged off or drenched with clean water.

Note: *The wetting of stone prevents the absorption of moisture from the setting mortar, thus insuring proper hardening of mortar.*

(34d) All cut stone work shall be set by competent stone setters level, plumb, square and true with uniform joints to the full dimensions and levels shown.

(34e) Except as otherwise specially noted, every stone shall be set in full beds of mortar; with all vertical joints flushed full. Completely fill all anchor, dowel, Lewis and similar holes. All bed and vertical joints shall be ($\frac{1}{4}$ in.) (specify) wide, (except as specially otherwise noted).

(34f) Soft wood wedges may be used only where necessary to prevent the crushing of mortar under heavy blocks, and shall be thoroughly soaked before use.

Note: *Only soft wood thoroughly soaked should be used. Lead buttons are preferable.*

(34g) (Heavy stones) (or) (projecting courses) (specify) shall not be set until the mortar in courses beneath has hardened sufficiently to support them.

(34h) Projecting stones shall be securely propped or anchored until the wall above has been built.

(34i) (Large blocks of stone) (column drums) (specify) etc., shall, in addition to the mortar bed, be set on an adequate number of lead-buttons symmetrically disposed to sustain the weight until the mortar has set.

Note: *Buttons should be set from 3 to 6 in. from the circumference of columns and about 2 ft. apart.*





(34j) The joints between all sections of columns shall be made with (5 lb.) (6 lb.) sheet lead cut back (2 in.) (specify) from the face and with center cut out to allow space for squeezing.

Note: Advocated only for columns of large diameter consisting of heavy units or sections.

(34k) The ends only of lugged sills and steps shall be embedded in mortar. The balance of the joint beneath the sill shall be left open until pointed.

(34l) All (cornices) (coping) (projecting belt courses) (stones forming gutters) (specify) etc., shall be set with the vertical joints unfilled. The exterior profile of these joints shall be caulked with (rope yarn) (picked oakum) and the joint filled full from above with mortar grout and raked out on top to a depth of $\frac{3}{4}$ in. After the grout has set, remove the caulking for pointing.

Note: Rope yarn is advocated due to the greater ease of complete removal when stripping the caulking.

(34m) Except as specially otherwise noted, mortar shall be raked out to the depth of $\frac{3}{4}$ in. from the face of the stone for pointing. Sponge the face of the stone clean along all joints.

(34n) Avoid splashing exposed faces of stone with mortar. Droppings and splashings shall be immediately removed with a clean sponge and water.

(34o) In no case shall stone work be set more than two courses in advance of the backing.

(35) Pressure Relieving Joints

(35a) At points indicated at (each story) (specify) furnish and set (in strict accordance with the manufacturer's details and instructions) Pressure Relieving Joints (as made by) (name manufacturer) (specify or describe).

Note: Due to the fact that a steel column 20 ft. high, when loaded to 16,000 lb. per sq in. will be nearly $\frac{1}{8}$ in. shorter than before the load was applied, the shelf angles instead of supporting the ashlar, may rest on the stone below and transfer the weight of the structure to the ashlar unless it can "give" a like amount. This condition is aggravated by movements due to temperature changes, wind pressure, etc. As buildings have become higher and masonry units larger, the provision of joints of a semi-plastic nature to permit these slight movements without spalling and cracking of the masonry have become increasingly important.

For large work a most satisfactory solution is the provision of a relieving joint of corrugated lead with a sheet lead cover. For ordinary stone work it is sufficient to place these joints between windows at alternate stories.

(36) Parging

(36a) The backs of all stones and the exposed sides of all bonding stones projecting beyond the normal ashlar back shall be parged with a coat of waterproofed setting mortar not less than $\frac{1}{2}$ in. thick before the masonry backing is built. Parging shall attain initial set before backing is laid.

Note: Parging with lime mortar, due to its porosity, has been found ineffective in the prevention of staining and efflorescence. Waterproof cement mortar tends to prevent both staining and efflorescence when the back of the stone is completely covered and the mortar attains its initial set before the laying up of the masonry backing. For this reason such parging has been strongly recommended. The fulfillment of these conditions in actual construction, especially with the speed attained, is very difficult. Consequently the use of stainless cement in backing masonry as well as facing is recommended in this specification instead of parging.

(36b) In the case of solid stone piers or columns, which are checked out to fit around concrete columns of concrete or steel fireproofed with concrete, a clear open space of at least 1 in. shall be maintained between the finished face of the column and the back of the stone.

Note: This is necessary, otherwise expansion of the concrete may split the stone due to difference in expansion when heated. See par. (2b), page 22 of Appendix D.

(37) Pointing

(37a) All face joints shall be brushed out (raked if required) clean to a depth of $\frac{3}{4}$ in. Carefully remove any wood wedges and loose mortar. Thoroughly wet the stone at joints and point (flush) (specify) with pointing mortar well driven into the joint and rubbed smooth with a jointer (to the section detailed).



Note: The flush joint very slightly weathered is strongly advocated rather than beaded or similar sections. The joints of ashlar may be weathered or slightly concave if desired.

(37b) Especial care shall be exercised in pointing up all washes to thoroughly protect the joint from the action of the weather.

(37c) The pointing of (balustrades) (tracery) (tops of coping) (steps) (specify) shall be done as the work progresses.

Note: This practice should be encouraged wherever the conditions are such as to make this procedure practicable for the stone setting contractor. All delicate tracery, balustrades and similar work should always be so pointed when set.

(37d) Thoroughly point up the open joints left under lugged sills to a depth of at least 1 in.

(37e) Wherever metal flashings are set in raglets, carefully point raglets flush with pointing mortar well driven into raglet.

Note: The flashing or cap flashing should be secured in the raglet with soft lead wedges preferably, or crimped pieces of sheet metal spaced approximately 12 in. on centers. Caulking should be done with pointing mortar rather than with commercial elastic cement compounds which experience has shown either dry up and crack after a comparatively short period or soften and tend to run out of the joints in warm weather.

(37f) The following top or wash joints in cut stone work shall be neatly and thoroughly caulked flush with (lead wool) (approved caulking compound).

Note: Here list and locate.

Note: On the better class of work, the caulking of the joints in wide washes of cornices, coping, belt courses, etc. and the top joints of steps, platforms, balcony floors, etc. with lead wool assures excellent protection against leakage and consequent damage by frost. When so caulked these joints may be kept tight by occasional inspection and re-caulking at a minimum cost. See also "Metal Flashing of Stone Joints" in par. 5, page 23 of Appendix E.

Note: Elastic caulking compound is also successfully used for this purpose and is less costly than lead. A large number of these compounds have recently been tested by the U. S. Bureau of Standards in Washington. Many of these proved of little value but a few have proven eminently satisfactory, both in these tests and in practical use in building. The trade names of tested compounds will be supplied by the Architects' Service Bureau.

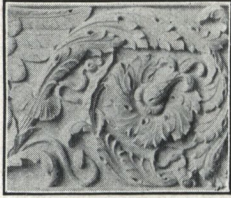
(37g) The joints in all (steps) (platform slabs) (specify) shall be caulked on the underside (unless bedded over wing or foundation walls) with (rope yarn) (oakum) and completely filled with (molten lead) (stainless cement grout and pointed with approved elastic caulking compound) well compacted and neatly finished flush with the stone surface.

Note: The elastic caulking compound is lower in cost and its elasticity provides for slight movements in supporting masonry.

(38) Protection of Finished Work

(38a) In general the covering and protection of finished work is included under the (General Masonry) (specify) (and) (Carpentry) contracts. This Contractor shall co-operate with these contractors and will be held jointly responsible for any damage resulting from neglect of these provisions.

(38b) During construction the tops of all walls shall be adequately and substantially covered by the contractor for (General Masonry) (specify) at night and during inclement weather or delays to insure against damage to finished work by weather.



Note: The importance of this protection cannot be too strongly stressed. Much unsightly staining of stone work can be attributed wholly to neglect of this provision, especially when rain or wash water from concrete floors or other masonry is permitted to come in contact with the wall masonry. It is advisable to hold the "General Masonry" contractor responsible for this

protection. Only when not included in the General Masonry division should the "Cut Stone Setting" contractor be held wholly responsible.

(38c) Walls shall at all times be protected from drippings during the pouring of concrete by tarpaulin or canvas supported on suitable outrigging provided by the (General Masonry) (specify) contractor.

Note: Include here and in other divisions where concreting may be carried on above the finished cut stone work and backing. Water and drippings from Portland cement concrete is a distinct menace to the cut stone work. For this reason whenever practicable concrete work should be finished prior to setting of cut stone.

(38d) Whenever necessary or as directed by the (architect) (specify) all (projecting individual stones or courses) (sills) (doorways) (specify) shall be protected against injury during construction by substantial wooden covering furnished and erected by (the Carpentry Contractor) (specify). (Steps and platforms) (specify) shall be continuously protected from injury until final completion. Wood containing excess of resin, tannin or other staining ingredients shall not be used unless set over adequate protective coverings of dry felt or resin sized building paper. Wood boxing and covering shall be maintained in substantial condition until removed (by the Carpentry Contractor) (specify) to permit the final cleaning down of stone work.

(38e) Contractor shall protect sills and horizontal courses

or other stone work projecting beyond the face of wall with covering of (boards) (red resin sized building paper, cut into strips of proper width, lapped 3 in. at ends and built an even $\frac{3}{4}$ in. into joints. This covering shall be secured with wooden wedges and weighted down and maintained until the pointing of the stone).

Note: Use this clause when setting contractor is to be responsible for protection of his work. Specify paper for residence and other small moderate cost work where the boxing or wood covering of finished work as in (38d) is considered unnecessary.

(39) Cleaning

Note: The best results are obtained when each stone is cleaned and thoroughly drenched just before it is set. Many contractors find this method also the most economical even taking into account the final cleaning which may be required. Cleaning may be done by hand, though the more rapid steam cleaning method is well adapted to both preliminary and final cleaning, and is recommended.

(39a) The exposed faces of all stone work set under this contract shall be properly cleaned down (as the stone is being set and) upon completion.

(39b) Cleaning shall be accomplished with a suitable steam cleaning process approved by the architect (or)

(39c) This cleaning shall be done by scrubbing with soap powder boiled in clean water, applied vigorously with stiff fibre brushes, adding clean, sharp, fine, white sand to the soap and water mixture where necessary. After scrubbing, drench all surfaces of the stone thoroughly with clear water.

(39d) The use of sand blast, wire brushes or acids of any kind will not be permitted under any circumstances for the cleaning of stone work.

ILCO-RIPLSTONE—MASTER SPECIFICATIONS

Note: This specification should be included in the "General Masonry" specification, preferably under a separate division. It should not be included with the "Cut Stone" specifications.

Note: Notes in italics are explanatory or advisory only and should not be included in the specifications.

Note: Wherever words or phrases occur in the body of the specification paragraph printed in italics and enclosed in parentheses, choose that word or phrase which applies to the particular work, omitting those that are irrelevant. Where the word "specify" occurs in italics enclosed in parentheses, add the particular word or clause applicable, optional with the specification writer.

(1) Work Included

(1a) The work included under this contract shall include all labor and material for the furnishing and laying of all exterior wall facing or ashlar (other than "Cut Stone Trim") in accordance with the drawings and as hereinafter specified.

(1b) For "Cut Stone" specifications included under a separate specification division, see pages (specify).

(1c) In general, this work shall include (list and locate).

Note: This paragraph ordinarily is not necessary.

(1d) Shop drawings will not be required.

Note: Indication of desired jointing scheme by sketch or reference to "ILCO Jointing Details" is sufficient.

(2) Stone

(2a) General—Stone shall be ILCO-Riplstone (Indiana Oolitic Limestone) produced by the INDIANA LIMESTONE COMPANY.

(2b) Stock—Stock shall be (Rustic Gray) (Rustic Buff) (Variegated) (Old Gothic) (specify) sawed on four sides.

Note: See paragraphs (6), (8) and (9), pages 5 and 6 under heading "Grading—Indiana Limestone."

(2c) Dimensions—

(2c1) Bed thickness shall be (4 in.) (3 in.).

Note: The stone should not be over 4 in. thick. This thickness is most easily broken to the required lengths and lays up with two brick widths or 8-in. tile backing for a 12-in. wall. Occasionally stone 3 in. thick can be used to advantage.

(2c2) Heights shall vary as required to be laid up in (Range Work) (Random Ashlar) (specify) as indicated on the drawings.

Note: Usually not over three (3) different heights are required, each (including allowance for mortar bed) in multiples of 2 in., $3\frac{3}{4}$ in. or 5 in., dependent on backing requirements. "Range Work" is usually preferable, due to the greater ease in laying it up, resulting in a much lower cost in the finished work as well as being more effective.

(2c3) Stone shall be furnished in sawed strips of promiscuous length varying from 3 ft. 6 in. to 6 ft. 5 in. which shall be broken up and jointed on the job to the lengths required to conform to the jointing scheme indicated on the drawings.

Note: These dimensions will cover all usual requirements and are sold for less than standard lengths. Adaptability to different architectural treatments is one of the great advantages of this type of construction.

(2c4) Facing shall be bonded to the masonry backing with bond stones. These shall be uniformly disposed and shall consist of approximately 10% of the superficial wall area. They shall extend into the backing about 4 in. and shall be placed in courses of relatively small height.

Note: The Building Officials' Conference at Madison, Wisconsin, in 1925, approved this bond as sufficient for Indiana Limestone Range Work or Random Ashlar wall facing backed up with brick or hollow tile. When Riplstone is used for facing masonry walls, bond stones are better than anchors, saving cost of both anchors and anchor holes, and furnish ample unity of action between backing and facing for both residence and non-bearing walls. The jointing details for such walls can usually be so selected that no additional sizes are necessary.

(2d) Finish—All stone shall be furnished with shot sawed finish with various degrees of reddish brown rust stain to give an interesting variation in color tone.

Note: See par. 3, page 8.

(2e) Joints—All joints shall be ($\frac{1}{2}$ in.) (specify) thick. End joints shall be (vertical) (splayed) (specify), (rough cut) (cut straight) (specify).

Note: $\frac{1}{2}$ -in. joints are recommended as the minimum thickness. Specify the type of end joint, whether vertical, splayed or a mixture of the two and the character of joint finish.



**(3) Mortar**

Note: ILCO-Ripstone should be set in non-staining mortar as specified in detail in par. (25), page 15, under the "Cut Stone Setting" division of the "Cut Stone-Master Specifications." The selection of the type of mortar should depend on the character and cost of the work. It is strongly advocated that the

backing in masonry walls be laid up in the same mortar instead of parging (see par. (4d)) to prevent unsightly staining of the stone work.

(4) Laying

(4a) Stone work shall be laid in strict accordance with the (detail) drawings to bond and joint as indicated.

Note: The architect should include a sketch or detail showing roughly the general type and character of the jointing, size and disposition of stone facing and on masonry walls the general location and disposition of bond stone. An area of from 10 to 20 sq. ft. will suffice.

(4b) (Except in freezing weather) all stone shall be thoroughly drenched with clean water just prior to setting.

(4c) Stones shall be laid with full beds of mortar with $\frac{1}{2}$ in. joints (raked back $\frac{1}{4}$ in.) (struck flush with the stone surface) (weathered) (specify) as the work progresses.

Note: A raked joint is appropriate and economical since it eliminates pointing.

(4d) The backs of all stones and the exposed sides of all bonding stones projecting beyond the normal facing back shall be parged with a coat of waterproof non-staining mortar not less than $\frac{1}{2}$ in. thick before the masonry backing is built. Parging shall attain initial set before backing is laid.

Note: Include only where masonry backing is laid in other than non-staining mortar. See "note" par. (3).

(4e) Stone veneer shall be anchored to the frame construction with (heavy galvanized iron wall ties) (6 in. non-rusting spikes driven into the studding at a slight angle and bent over the back edge of stone). Spike anchors shall be spaced not to exceed 24 in. apart vertically or horizontally.

Note: The non-rusting spike anchor is preferable.

(5) Cleaning

The stone work shall not be cleaned down after completion, but where necessary, the stone shall be washed free of dirt or other objectionable accumulations prior to setting.

All mortar droppings adhering to the stone shall be immediately removed. Sponge the stone free of mortar along the joints as the work progresses.

Note: The face of the stone as shipped to the job is covered with a white powder-like material known as saw slush. If this slush is not removed, but is permitted to weather away after the stone is laid, some of the stone will take on added attractive color.

**APPENDIX A—Staining and Efflorescence**

Disfigurations occurring on limestone due to seepage from masonry backing may be divided into three distinct divisions. First, efflorescence, which is a whitish deposit that appears many times on wall surfaces. Second, brown stain, which is a dark oak brown discoloration that closely resembles varnish and appears only on buff limestone. Third, gray stain, which is a grayish dark glassy film that occurs mostly on unseasoned gray stone.

Each of these is caused by water seeping through the backing materials, leaching out soluble salts and carrying them through to the surface of the stone. Any of the soluble salts found in brick, concrete blocks, tile, mortar, concrete and other building materials may cause efflorescence. These salts usually consist of magnesium sulphate, calcium sulphate, sodium sulphate, also in some cases sodium chloride. Only soluble fixed alkali salts, principally the carbonates and hydroxides of sodium and potassium, can produce the brown stain found on buff limestone.

Our research work shows us that under usual construction conditions these salts come only from certain types of cements which stain limestone.

Gray stain may be produced on unseasoned gray stone by water above leaching through the stone. The formation of gray stain on seasoned stone may be produced by water carrying small quantities of calcium sulphate through to the surface. This calcium sulphate undoubtedly comes from the cement used in the mortar and concrete.

It is thus evident that neither efflorescence, buff stain nor gray stain can occur without the presence both of water and of soluble salts and so can be prevented entirely by their elimination, and usually can be effectively suppressed by the elimination of either one. Since it is practically impossible, however, to entirely prevent moisture from entering wall masonry and since most building materials contain some soluble salts the only practical method is to reduce to a minimum the amount of

water which can enter the wall and also to use building materials that are known to have the lowest possible content of soluble salts.

Brown stain and much of the gray stain may be prevented by using a non-staining cement in the stone setting mortar and in the mortar used in laying up the backing material. When the backing is set in a staining cement mortar much staining can be prevented by setting the stone and parging the back of it with a non-staining cement provided there is no seepage from the backing material into the stone. The use of a non-staining mortar will merely retard, not prevent, such seepage. The use of a non-staining cement has no bearing on the formation of efflorescence.

The use in the mortar of integral waterproofers of the water repellent type will prevent the penetration of water through the wall, and, consequently, the formation of both efflorescence and staining. The waterproofers consist of ammonium and calcium soaps (stearates) and are added to the mortar as it is being mixed in amounts as directed by the manufacturers. This is usually 2% by weight of the cement or cement and lime used. The mortar is then used as any other mortar for setting both facing and backing material or for parging the back of the stone facing. The result is a wall having each individual unit isolated with a waterproof mortar jacket. Any leaks that may occur will thus be isolated and water will not spread throughout the wall as it does when a waterproof mortar is not used.

It has been found that the waterproofers of the densifying type, while they may produce a superior concrete, do not produce a mortar tight enough to prevent efflorescence.

While the effectiveness of integral waterproofers as stated has been established without question, the use of *stainless* cement mortar is recommended in this specification pending the trial in actual construction of waterproofed mortar made from ordinary cements.

APPENDIX B—Waterproofing Compounds

While we do not generally recommend the waterproofing of Indiana Limestone, there are types of construction, of which the terrace shown on ILCO Detail 8 is an example, where the use of suitable waterproofers is advisable. Consequently we believe the following summary of waterproofers and their uses based on facts obtained from our Research Department and from other authoritative sources will be of value in determining

the proper use of the different types now most commonly sold.

There are two distinct classes of waterproofing materials; those of the colorless type which can be applied to exposed surfaces and the black type made up largely of bituminous material which should be used only on the back of the stone or on the face of the masonry backing or other places where the black color is not objectionable.



Colorless waterproofing compounds are of two general types, those having a paraffin base and those having an aluminum stearate base.

The paraffin type has the disadvantage of darkening the color-tone of the stone for some time, also at times giving it a greasy appearance. This will in most cases gradually bleach out, leaving the stone with a

satisfactory light color. The type is, however, fairly effective as a waterproofing agent, retaining its effectiveness for many years.

The paraffin waterproofer is recommended for use on exposed base or grade course stone for exposed walls or balustrades surrounding terraces such as that shown in ILCO Detail 8 and for the tops of copings and washes of main cornices. It is also recommended for use on trim jobs where limestone is practically surrounded by mortar or other building materials which may contain soluble alkali salts and thus become a potential source of staining or efflorescence. On such trim jobs all four sides and sometimes even the ends should be treated.

Aluminum stearate waterproofer have the advantage of not darkening or appreciably changing the natural color-tone of the stone, but they are not permanent and will generally lose their waterproofing value within two or three years. The manufacturers of aluminum stearate waterproofer contend, and there seems to be evidence to bear out this contention, that their product when properly applied will keep the stone clean and tend to lighten its color-tone. Aluminum stearate waterproofer are sometimes, though rarely, recommended for building exteriors in localities where the amount of soot and dirt in the atmosphere is excessive. It is recommended for some places on building interiors where finger marks or other forms of defacement are troublesome.

Black waterproofing compounds contain bituminous material as their principal base and may be generally divided into three types, as follows:

(1) Those preparations that consist of mineral asphalt or coal tar which is cut with volatile solvents such as gasoline to such a consistency that it may be applied with a brush.

(2) Asphalts which are emulsified in water with the aid of some inert emulsifying agent, to a somewhat stiffer consistency than Type 1.

(3) The mastic type, comprising those bituminous waterproofing compounds which are of such a consistency that they must be applied with a trowel or similar tool.

Type one and two have many uses in building such as the waterproofing of foundations, dampproofing courses through walls at grade line and elsewhere and in any place where they can be applied to the backing material to break the capillarity between this backing and the stone facing. They also have been used quite extensively in the past for back painting stone, but this procedure is not now much used, due to the fact that it did not achieve desired results. One of these type should be applied as indicated in ILCO Detail 8 and in all cases where water containing alkali or vegetable matter might otherwise reach the back of Indiana Limestone facing.

Type three is generally used for waterproofing spandrels, in modern skeleton frame construction, on the top of vaulted stone ceilings, and roof construction or at other points at which it is desired to obtain a more thorough protection from moisture seepage or from contact with newly poured cement.

When limestone is coated on the back and beds with waterproofing applications the bonding property of the stone is materially impaired and provisions must be made to procure sufficient bond either with additional anchorage or bond stones.

Information giving classification of commercial waterproofer which can be recommended, specifications and detail instructions for application will be sent upon request. Revised bulletins on such subjects are constantly available.



APPENDIX C—Structural Steel Design

(1) General

It is most important that careful consideration of the characteristics and requirements of the limestone facing be taken into account in the preliminary layout of the structural steel.

The best practice is to detail the spandrel sections during the early stages when preparing the small scale drawings, thus establishing the ideal position of columns, girders and main beams in close relation to the architectural features of the design rather than endeavoring to study the facing material together with the details of support for enclosure walls after the main elements of the structural steel design have been definitely fixed.

This practice not only is of prime assistance to the Structural Engineer, but will often result in considerable economy in the steel work.

(2) Spandrels

When an Indiana Limestone facing is used, the spandrel sections should be kept as simple as possible. Much small steel, such as angles, channels and loose lintel steel, can frequently be omitted when a properly designed spandrel girder is placed in the right position for the support of both facing and backing of enclosure walls.

Masonry, and particularly stone work, is decidedly more rigid than steel. Therefore, the steel work for its support should be designed with this in view. It is also important to so detail the work that the stone facing will not be pinched between supporting members of the structural frame when slight movements due to temperature changes, settlement and wind pressure occur. In quite tall buildings, pressure relieving joints in the masonry are recommended. See par. 35, page 18 of "Cut Stone Setting" specifications.

Often a single deep built up plate and angle section is preferable to a plain rolled section or combination of shapes for spandrel members. This does not necessarily involve a greater weight of metal for spandrel girders or lintel members supporting masonry walls, but a different disposition of the material, usually resulting in a stiffer construction.

Any attempt to support lintels or walls over wide openings with steel sections that will deflect appreciably will usually produce arch action in the masonry, preventing the steel from carrying the loads as designed. This may cause excessive

stresses at points in the masonry which will result in crushing the mortar, opening of joints and spalling or chipping off of corners or cracking of the stone.

On the other hand, too much steel in spandrel walls should be avoided; it is necessary only that the supporting members be sufficiently stiff to carry the actual load without putting stress in the enclosure wall masonry.

Stone lintels should be made self-supporting whenever practicable, thus simplifying the spandrel sections which need only support the spandrel panels and sills on the structural frame. Windows in pairs or groups with stone mullions supporting the lintels frequently give the appearance of greater structural stability to the design.

Where shelf angles for lintels must be used, it is often better to use loose lintels than to have them rigidly connected to the structural frame. Where connected to the frame, it is advisable to bracket or hang them from the spandrel girder with a slotted bolt connection that will permit some adjustment. Such steel members may thus be brought into the exact position for the support of the stone as fabricated without the necessity of expensive field fitting to compensate for the slight inaccuracies always found in construction.

Lookout angles and similar members for the support of projecting stone work should likewise never be rigidly connected but should always be fastened to the frame with a hooked or bolted connection over shim plates that will allow adjustment to the exact position required.

(3) Columns

There is a tendency to place wall columns too close to the face of the wall. It is good practice to so fix the column position that it will permit the thickness of stone facing and one course of brick work plus the proper allowance for joints between the outer face of steel and the normal wall face.

Placed in this position, the eccentric loading from walls can generally be balanced by the eccentric loading from floor girders and will usually allow the flanges of the columns to be turned out toward the face of the wall where they best serve for resisting wind stresses and for wind bracing connections, permitting the floor girder connections to be placed on the opposite flange.

APPENDIX D—Mortars and Reinforced Concrete Construction



(1) Mortars—Cause of Staining

Research and authentic tests have conclusively proven that in the majority of instances, the principal cause of staining on Indiana Limestone is soluble alkali salts contained in the cement, lime or sand of mortar, or in the brick or tile of the backing masonry. See Bulletin 33 of the Engineering Experiment Station

of Purdue University, as well as other available publications.

It has also been demonstrated that the soluble alkali-content of the various cements parallels the degree of intensity of the staining produced on Indiana Limestone, when mortars of these various cements are placed in contact with it and kept in moist condition.

The cements that produce bad staining all show from 20% to 65% soluble material calculated as Na_2O by methods used at Purdue University, while those which were practically non-staining in their effect, even under the severe conditions of the test, run from 1% to 3%.

Hence the very definite recommendations as to mortars for the setting, pointing and parging of Indiana Limestone given in paragraphs (25), (26) and (36), pages 15, 16 and 18 of the "Cut Stone Setting" specifications and the suggested provisions given in the following heading.

Indiana Limestone *must never* come in contact with mortar containing ordinary unwaterproofed gray Portland cement. Moisture, passing through staining cement mortar or concrete and drawn into the stone facing in the drying out of walls, may be sufficient to cause staining that will at least temporarily mar the uniformity of the natural light color tone of the Limestone.

(2) Reinforced Concrete Construction

(2a) Dampproof Painting of Concrete—All surfaces of concrete with which either the Limestone or the immediate Limestone backing will come in contact should be thoroughly coated with a standard brand of Dampproof Paint or Asphaltic Waterproofing Compound. This should include all walls adjacent to the stone work whether reinforced concrete frame, concrete wall work or concrete fireproofing and floor construction. This dampproofing of concrete surfaces is less expensive than back-painting of the stone facing, which is not recommended.

A moderately heavy asphaltic or mineral bitumen dampproofing compound of well established brand is recommended. If a thin preparation is used or if the concrete is porous, two coats are advisable—a heavy impervious coating is imperative. See Appendix B, page 20.

(2b) Clearances—Where stone work is slabbed against or applied to a backing formed by concrete structural members, an ample allowance for back joint should be provided. A full 1-in. *minimum* should be allowed, though 1¼-in. is better, particularly at columns. However, a clearance of more than 1½ in. may cause difficulty with supporting angles, etc. With a 1-in. allowance the actual clearance will seldom average over ¾ in. The greater clearances make allowance for the irregularities in concrete work due to swelling and warping of forms,

assure a reasonably thick back-joint for the proper protection of the stone and often obviate the necessity of expensive and improper field cutting and dressing.

In the case of solid stone piers or columns, where the stone is checked out hollow to fit around reinforced concrete columns or steel columns fireproofed with concrete the back joint should *not* be filled in or the stone bedded solid against concrete, since the expansion of concrete due to moisture and temperature changes is liable to split the stone. In such instances at least a full 1-in. clearance should be allowed between the finished face of concrete and the back of the stone.

It is equally important that ample clearance be allowed in connection with the bedding or support of stone work on concrete members.

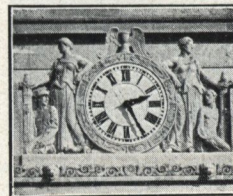
(2c) Avoid Pouring Concrete Against Unprotected Stone Work—Concrete must never be poured against cut stone or against ordinary common brick or tile backing in contact with stone. Whenever possible, the concrete structural work should be completed before the stone facing is erected. Where the work must be carried up jointly as in the case of Limestone faced load-bearing walls carrying concrete floor construction, concrete ceiling slabs, mezzanine floors, stair landings, etc., always provide an impervious dampproof coated hard burned brick or hollow tile backing for the stone and a thoroughly waterproofed slab seat on the top of the wall against which the concrete may be poured.

Even when concrete floor construction is supported on a wall which will form a backing for stone work to be erected against it after the concrete has been placed, it is important to prevent this backing from absorbing water from the concrete. Such walls should be covered with waterproof felt paper or dampproofed before the concrete is poured.

(2d) Protection Against Wash, Splashing, etc.—There is always great danger of staining from the water washing over reinforced concrete fireproofing and floor construction during rainstorms. This wash should not be permitted to fall on and be absorbed by the stone or the brick or tile backing. Complete protection of the walls from all dripping or wash from the structural floors, scaffolding, etc. above, by tarpaulins or canvas supported by properly constructed outriggers should always be provided. Likewise provide protection against the splashing of stone work during the pouring of concrete. Whenever possible, pouring of concrete in walls should be finished before setting of cut stone.

(2e) Anchors, Sockets, Etc.—Build into the concrete any anchor's, sockets, etc., required for the support or fastening of stone facing or enclosure walls. Anchors must usually be adjusted after setting of concrete. Several types of special fasteners for anchors have been developed for this work. Consult the Architects' Service Bureau for details.

Where the stone is to be supported on shelf angles fastened by bolts or sockets built into the concrete, it is advisable to drill these angles in the field to assure accurate location to fit the fabricated stone. Steel outlooks supporting stone should always be designed to permit adjustment.



APPENDIX E—Roofing and Sheet Metal Work

(1) General

Reference to paragraph (1) of Appendix D above, establishes that the staining of Indiana Limestone and efflorescence is principally due to the seepage into the stone of moisture carrying soluble alkali salts contained in the cement, lime or sand of mortar or in the brick or tile backing masonry.

The prevention, therefore, of the wash from roofs and water passing through the backing masonry in any appreciable quantity or the seepage through improperly filled or flashed joints in washes of Cut Stone work is imperative if efflorescence or unsightly discoloration of the stone is to be obviated.

In the majority of cases to assure permanently the best appearance of a stone building, it is advisable to carry the water back to a gutter and avoid any wash over the face of the building. Even when the cornice occurs at the base of a parapet or attic wall, it is often better to provide a metal-lined

gutter at the foot of the wall than to pitch the top of cornice outward to drain over the face. In such instances, it is advisable to cover the cornice wash entirely with metal.

(2) Sheet Metal Work

Sheet copper as a material for flashing, gutter lining, etc., when applied to Indiana Limestone or other light-colored stone, must be carefully detailed to avoid the possibility of staining from the copper, since the wash soon becomes a metallic oxide staining solution. There should be no possibility of wash from copper flowing over the face of stone. The same provisions apply to bronze or brass railings, lamp standards, statuary or other ornamental features—proper drips should be provided in all cases. A coat of pure linseed oil applied to copper alloys before oxidation sets in and occasionally renewed will very much retard oxidation and thus tend to reduce staining.



Sheet Lead, Zinc, Aluminum and Block Tin are preferable to copper.

Wherever copper is used for flashing, gutter lining, etc., applied directly to Indiana Limestone, a course of comparatively thin, smooth black waterproof paper should be laid between the copper and the stone to prevent staining due to sweating or condensation on the underside of the

copper. Ordinary felt paper is not suitable and if used, only asphalt impregnated felt is permissible.

(3) Raglets

Metal cap-flashings should preferably be set into raglets rather than into the stone joints. Raglets can be cut in the stone horizontally, vertically or at any angle and can generally be provided at low cost if they run straight and are not stopped or stepped in a manner that prevents cutting by machine methods.

Raglets from $\frac{3}{8}$ to $\frac{1}{2}$ in. wide by from $\frac{3}{4}$ to 1 in. in depth are standard. The metal cap-flashing should be securely fastened in the raglet with soft lead or small crimped sheet metal wedges spaced about 12 in. apart and pointed flush with pointing mortar.

Molten lead should not be used for filling raglets as the temperature stresses often increased no doubt by the conversion of moisture into steam, have in several cases split the stone. Raglets are troublesome and expensive but we have no satisfactory substitute to offer.

Wood wedges should never be used to secure sheet metal flashings in raglets, even temporarily, since they will absorb moisture and swell and may readily split the stone, especially where, as is often the case, the raglet is close to the edge.

(4) Parapet Walls and Coping

Brick backed parapet walls are frequently a source of trouble, especially when surrounding blind balconies. Seepage through them often causes unsightly staining of the portions of the building walls below them. The conditions acting upon a parapet wall are more severe than upon the main walls of the building below the roof line, since it is exposed on both sides and the metal counterflashing at the back is difficult to maintain in a tight condition when secured in the usual brick joint. Again the brick itself often absorbs considerable moisture

and the mortar joints seldom are perfect and allow driving rains to penetrate the wall.

It is therefore recommended that the entire back of all parapet walls which are not faced with cut stone be backed up with vitrified brick or tile set in waterproof cement mortar. Otherwise they should be parged with waterproof cement mortar or covered with metal or impervious roofing material and the flashing be carried under the stone coping to within two inches of the front face of the wall. See ILCO Detail Sheet 15.

Much trouble with parapets may be avoided by facing the backs with cut or sawed stone. Under ordinary circumstances, where the parapet is not over 8, 10 or 12 in. thick, the cost of the stone parapet will be no more than if backed with brick, especially if this is waterproofed.

(5) Metal Flashing of Stone Joints

In connection with fine monumental buildings and for all important work where the best known protection is desired against the seeping of water through the vertical joints of horizontal members with wide washes, such as cornices, belt courses, coping, etc., a metal flashed joint as described below is strongly recommended. This applies particularly to those washes where it is not practicable or desirable to cover the entire top with sheet metal.

The vertical joints that are to be flashed should first be grouted full with setting mortar. Strips of pure block tin about $\frac{3}{8}$ in. thick and 4 or 5 in. wide are then placed over the joints and turned down $\frac{1}{2}$ in. in raglets cut parallel to the joint. Strips should be carried nearly to the front of the projecting course and should be let into a raglet or joint on the back wall about 2 in. above the joint covered. Tin strips should be fastened into raglets with lead buttons spaced about 4 in. on centers and the raglets pointed flush with cement mortar. See ILCO Detail Sheet 15.

This takes the place of caulking with lead wool or elastic caulking compound and though more costly, is probably superior to any other method for use on the highest grade of work.

Block tin will not become dark but weathers to a color which blends with the stone and is scarcely noticeable, even when not above the sight line.

APPENDIX F—Cleaning

(1) Steam Cleaning

For more than ten years the Architects' Service Bureau of the Indiana Limestone Company and its predecessor, the Indiana Limestone Quarrymen's Association, have been working on the development of a method for cleaning Indiana Limestone buildings which would be effective and economical and free from the harmful results following the use of acids or sand blast.

The so-called steam cleaning method, developed largely by one of our research engineers with the aid of several cleaning companies, has now been in commercial use in nearly all parts of the United States for several years and we believe that it is the best solution of this problem yet found.

It is a machine method with which rapid work can be done at small labor cost. It is equally successful for cleaning new and old buildings not only of Indiana Limestone but also of brick, terra cotta and other building materials. The equipment is simple and no expert knowledge is necessary in the execution of the work. The cost is generally lower than that of any other method previously employed.

The equipment required is a steam boiler capable of producing clean steam at 150 lbs. pressure, steam and water hose to carry this pressure and a special nozzle. Cold water and steam are carried to the building face where they are mixed in a special nozzle, the cleaning being effected by a spray of very hot water impinged against the building at a high velocity, both heat and velocity being supplied by the high pressure steam.

All soot, grease and dirt are dissolved or carried away by the hot water, markings and texture of the stone being brought out more clearly than by any other method.

Some few forms of stain and encrustation which do not yield to steam treatment can be removed by special applications, directions for the use of which will be given upon request.

Several special portable boilers costing from \$1100 up have been put on the market for the production of steam. The cost of this work when done by steam cleaning companies varies from 5c to 10c per surface square foot, depending on the size of the building and its condition.

Specifications for cleaning old and new buildings, special nozzles, description of equipment, detailed instructions as to the application of the method, names of available cleaning companies and of buildings which have been cleaned in various parts of the country will be furnished upon request by the Architects' Service Bureau.

(2) Acids

Except as noted below, acids should never be used on Indiana Limestone in connection with steam cleaning or any other process. Strong acids invariably attack the stone, producing unsightly spots and streaks.

There are a few conditions under which certain acids in a very dilute form may be used to advantage but such extreme care should be exercised that even these are rarely recommended.

(3) Scrubbing

When steam cleaning is not practical the best method is to scrub the surface of the stone with any white soap powder dissolved in *soft* water using an ordinary fibre scrub brush.

Do not use a wire brush or steel wool unless you are willing to find later small rust spots scattered over the surface of the building where particles of steel have lodged.

(4) Sand Blast

Sand blast as applied to Indiana Limestone is perhaps a little less harmful than the use of acids. After cleaning by this method the surface appears whiter but this whiteness is due partly to white stone dust and particles of sand imbedded in the pores and partly to "stunning" or bruising of the stone.

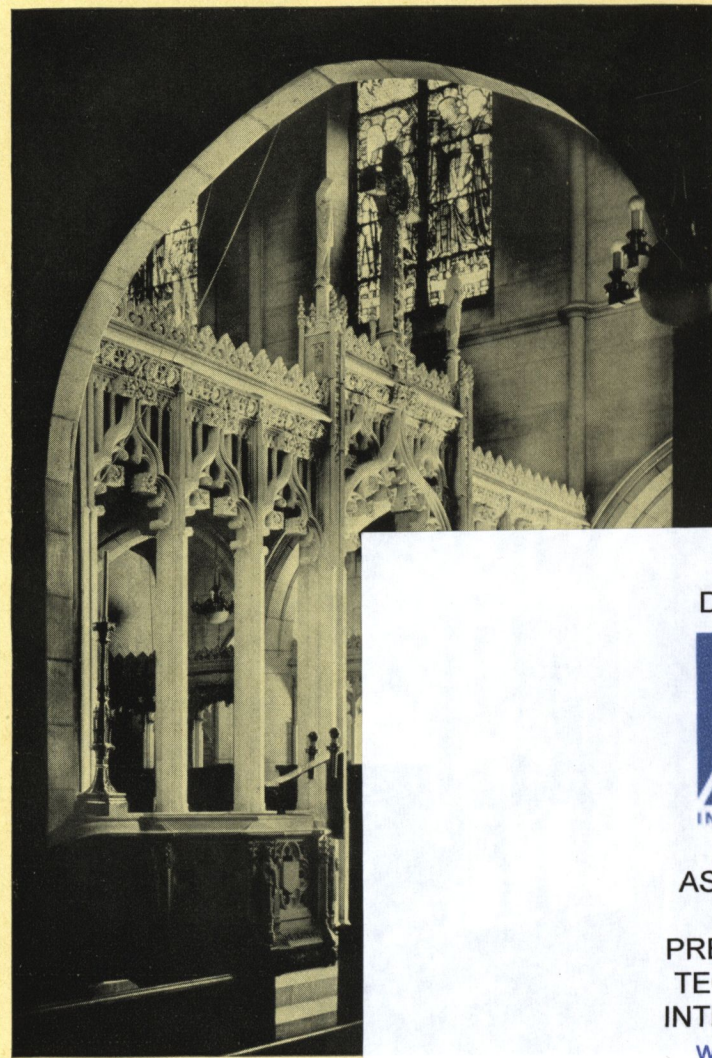
The worst feature of this method is that the surface is roughened and the pores of the stone which had been at least partially closed by weathering are laid open, resulting in a more rapid accumulation of dirt.

When Indiana Limestone is sand blasted the pressure at the compressor should be not over 30 or 40 lbs. per sq. in.



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